POPULAR SCIENCE

JANUARY · 35c *Monthly*

Annual Auto Issue

- Specifications of All 1958 Models
- How Safe Are the New Cars?
- Facts on 14 New Station Wagons
- How Good Are Air Springs?
- Care & Feeding of Your '58 Car
- What the Public Wants Next Year

Eyewitness Report on Russian Technical Skills

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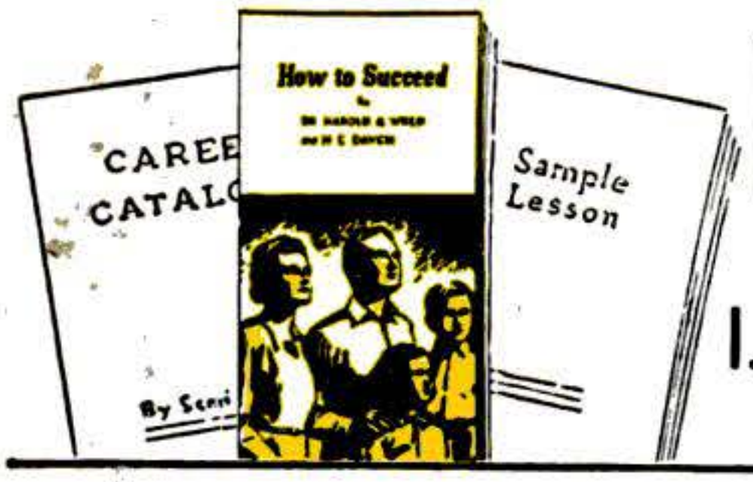

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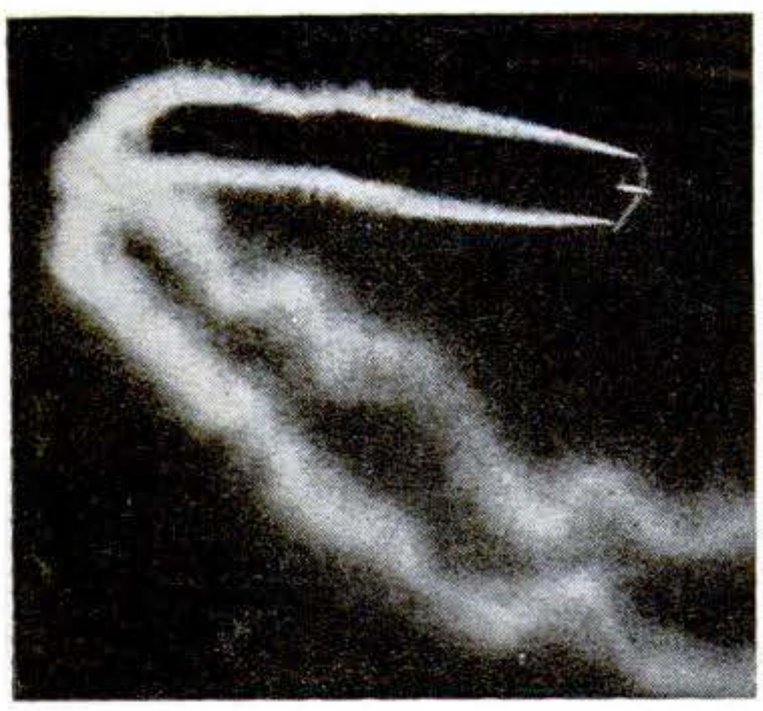
Popular Science Monthly

January, 1958

Thinking of a wagon? Color photos of 14 new station wagons show you what they look like. And a spec chart lets you compare all the important dimensions



They're flying the big babies like stunt planes to give our Strategic Air Command new knockout power

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Senior Editor Harry Walton takes you behind the Iron Curtain for a close-up appraisal of Soviet technical achievements: quality, quantity, how everyday products compare with American equivalents

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PS Readers

TALK BACK

Blast Off and Live Longer?

You say "an increase in speed slows time" ["Will Space Travel Lengthen Life?" Oct.]. But isn't any movement relative?

Therefore, to an observer on earth, the life processes of a man in a space ship would appear to be going on at only half the normal rate. But to the man in the ship, the earth would be moving away at the same speed and the life processes of a man on earth would appear to be going on at only half the normal rate. Since each of these effects would cancel out the other, if the ship were to land on earth

the people here would have apparently aged the same amount as the man in the ship.

RICHARD ROCHBERG, Baltimore

You are describing the "clock paradox," which has disturbed scientists ever since Einstein published his first relativity paper. Meson experiments have proved that the paradox doesn't exist.

. . . The author of your space travel article says that at the speed of light a round trip through the universe would take 42 years. He probably means a trip through our solar system. Most of our nearest stars are more than 42 light years away. About 600 million years might give one a fair start for a round-trip jaunt through the universe.

C. N. SNARE, Cripple Creek, Colo.

You forget the effect of speed on time. That round trip through the universe would take four billion years, as measured by clocks on earth. *But clocks aboard the rocket ship would tick off only 42 years—the speed of the rocket ship would slow down its clocks that much.*

. . . You say that at 160,000 m.p.s., you could make a space flight lasting 10 years by earth reckoning and age only five years. Then you say a four-billion-year trip through the universe would age the traveler only 42 years. The ratio doesn't seem to be correct. Is it?

REV. JOS. STRINGER, Lawrence, Mass.

The ratio isn't linear. The factor involved is $\sqrt{1-(v^2/c^2)}$, *where v is velocity of the rocket ship and c is the velocity of light.*

. . . Speed vs. time may no longer be "a matter for Einsteins," but after reading that October article, my feeble brain is rocketing like a sick Sputnik in space. You say nothing tangible can travel faster than light. How come when we all start shooting into space to live longer, we'll never get to move faster than light?

W. R. ARTHUR, Chicago

Mass increases with speed. If the velocity of an object reached the velocity of light, the object would have an infinite mass. So an infinite force would be needed to accelerate it to that speed. Infinite masses and infinite forces are unattainable. So the velocity of light—for material objects—is approachable, but not attainable.

Tip for Straightening Bent Wire

YOUR contributor's way of straightening bent wire, by drawing it between thumb and screwdriver handle [Sept., p. 274], may result in a torn or burned finger.

I have my boys do the job by passing

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Does your engine feel only *half-there?*

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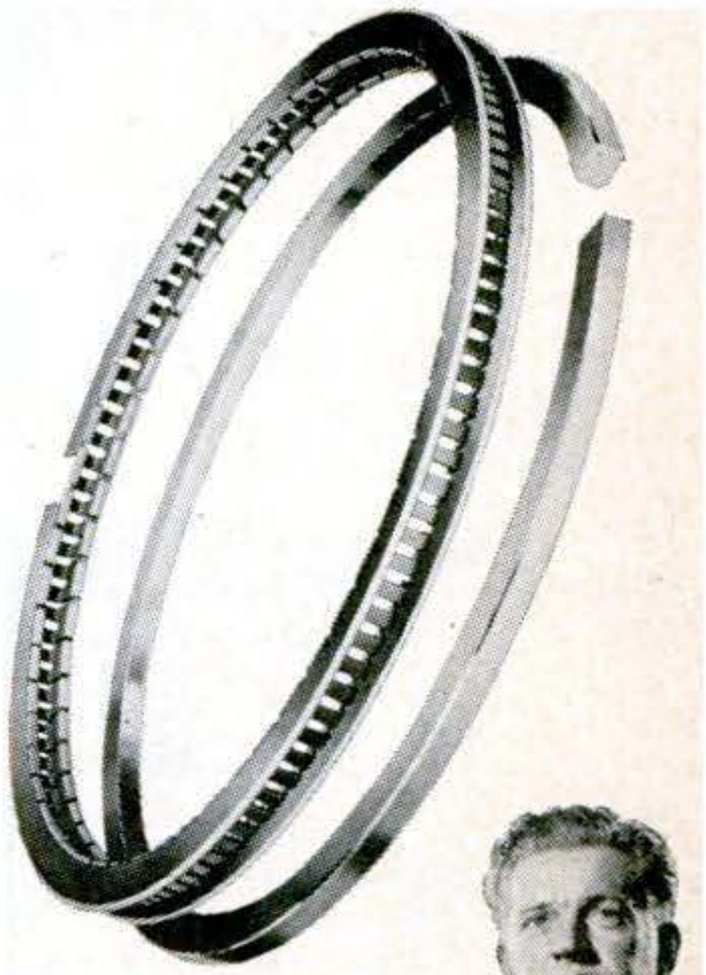

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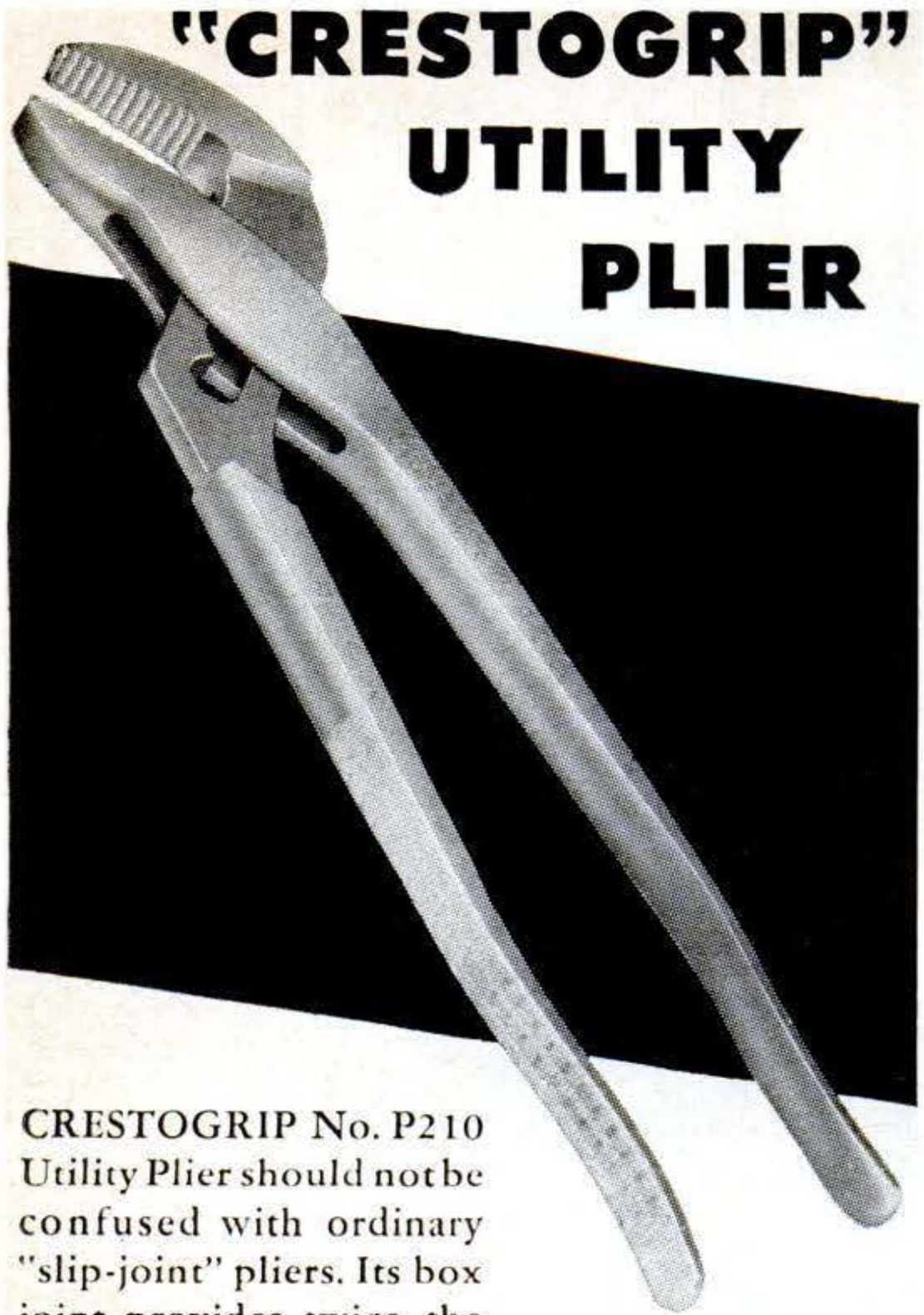

CRESTOGRIP No. P210 Utility Plier should not be confused with ordinary "slip-joint" pliers. Its box joint provides twice the strength of the conventional lap joint and eliminates sideways twist and strain. Grips flat, square, hex or round objects with powerful leverage. Adjusts to four positions up to 1½" capacity. It has no rivet projections and measures only ½" at its thickest point. Finished in rust-resistant zinc plate.

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the vise-clamped wire through a hole drilled in a length of broom handle or dowel. The stick, turned slightly so that the wire rubs against opposite sides of the hole, is drawn the length of the wire.

NATHAN B. WOOD
Westinghouse Voc. H.S., Brooklyn

Ford Article Beats Manual

I CERTAINLY did enjoy your article on how to take care of a '57 Ford [June]. It was so instructive that I've saved it. In fact, it told me something that the owner's manual did not: that there are drain cocks on both sides of the block, a point that came in handy recently when I put in my antifreeze.

ROBERT A. FULLER, White Plains, N.Y.

Door Idea Leaves Him in a Jamb

I HOPE none of your readers built that space-making pantry for storing canned goods behind a kitchen door [Sept., p. 212]. By "stealing an extra inch" as

you suggest, they'd end up with a door that wouldn't open to a 90° angle any more.

ART ROSENFELDER, Chicago

This is true only if the door is set deep in the corner. Our sketch shows the door jamb about 4" away from the adjacent wall. Add about 2" more for the width of the jamb and there is at least 6" of space that can be used for shelving.

Woodworkers Wanted

YOUR readers may be interested in winning one or more of the 309 prizes in our National Woodworking Contest. Projects must fit into the following classifications:

1. Articles made with surfaces actually veneered by the contestant.
2. Lumber projects made of wood ⅛" thick or thicker.
3. Combinations of solid wood and plywood, or lumber and veneers.

Contestants should submit photographs

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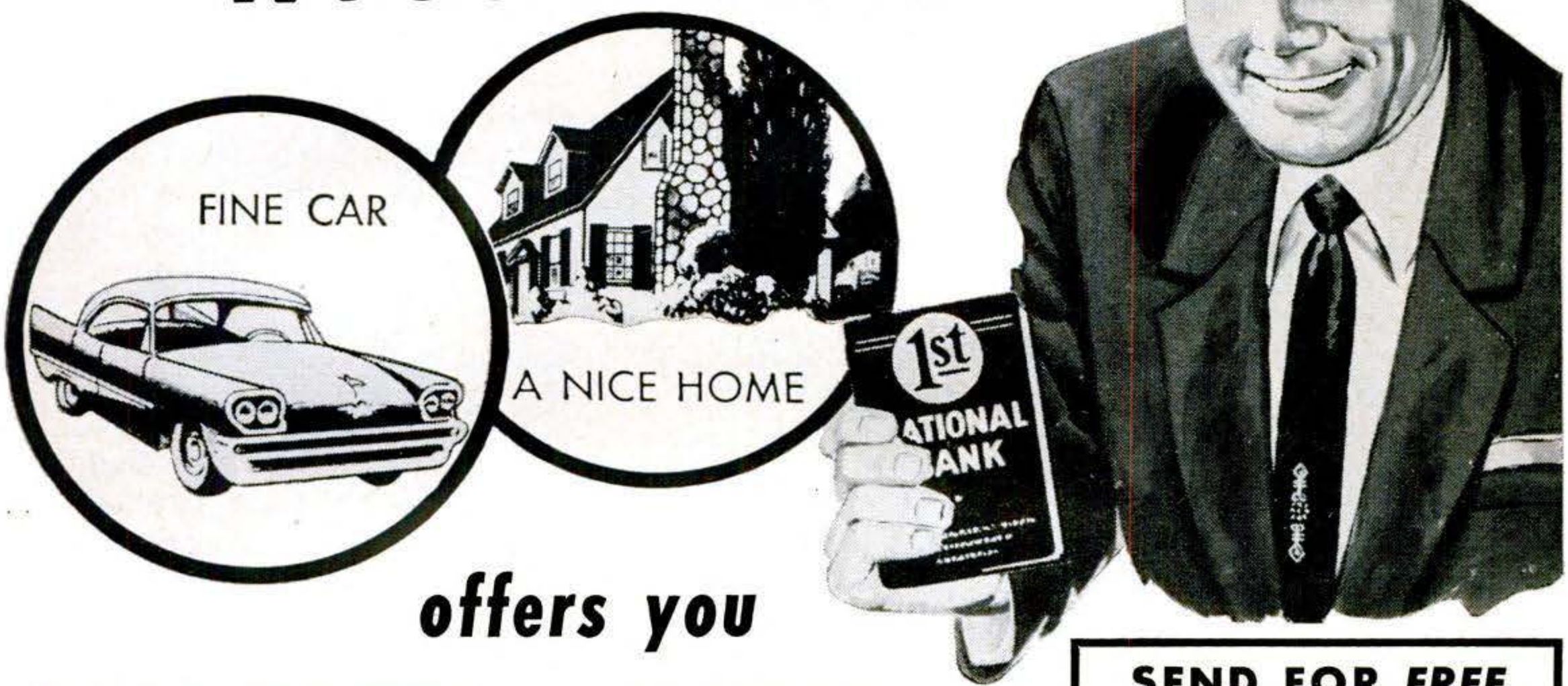

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of their work, and brief description, before March 31st.

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ALBERT CONSTANTINE JR., NYC

For more information and an entry blank, write Constantine's National Woodworking Contest, 2050 Eastchester Rd., NYC 61.

You *Can* Get Wire-Tread Tires

AFTER reading "Snow and Mud Tires" [Oct.], we'd like to take issue with the paragraph on embedded wire. You say:

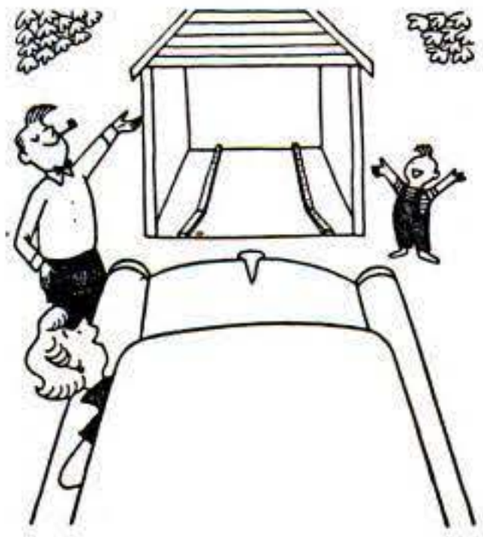
"Because it's noisy, wire isn't used in passenger-car tires." While the crown of the coiled wire in a Penetred is exposed (say for 50 miles or so), there is a faint click. Thereafter, there is no sound . . . and thousands of motorists now drive these tires the year around.

"It is costly." Phenomenally increased traction, carcass-heat removal and tire protection, together with the fact that wire-embedded tires are the only ones that can be used on front wheels for better steering control, make the small added cost an investment in safety.

"The steel may wear faster than the rubber." The wire coil floats in the rubber tread, being bared only when torque—either braking or accelerating—is applied.

PAUL J. FELKER, Penetred Corp.
Marshfield, Wis.

Or Give Up Driving Altogether?



DOES anybody think that those flimsy little laths that fellow has nailed to the garage floor as guides ["Wordless Workshop," Oct.] will keep a bum driver out of trouble? Those fat tires will run right over them as if they weren't there. Better get a smaller car or a bigger garage—or maybe take some needed driving lessons.

H. N. ROWLAND, Parkerford, Pa.

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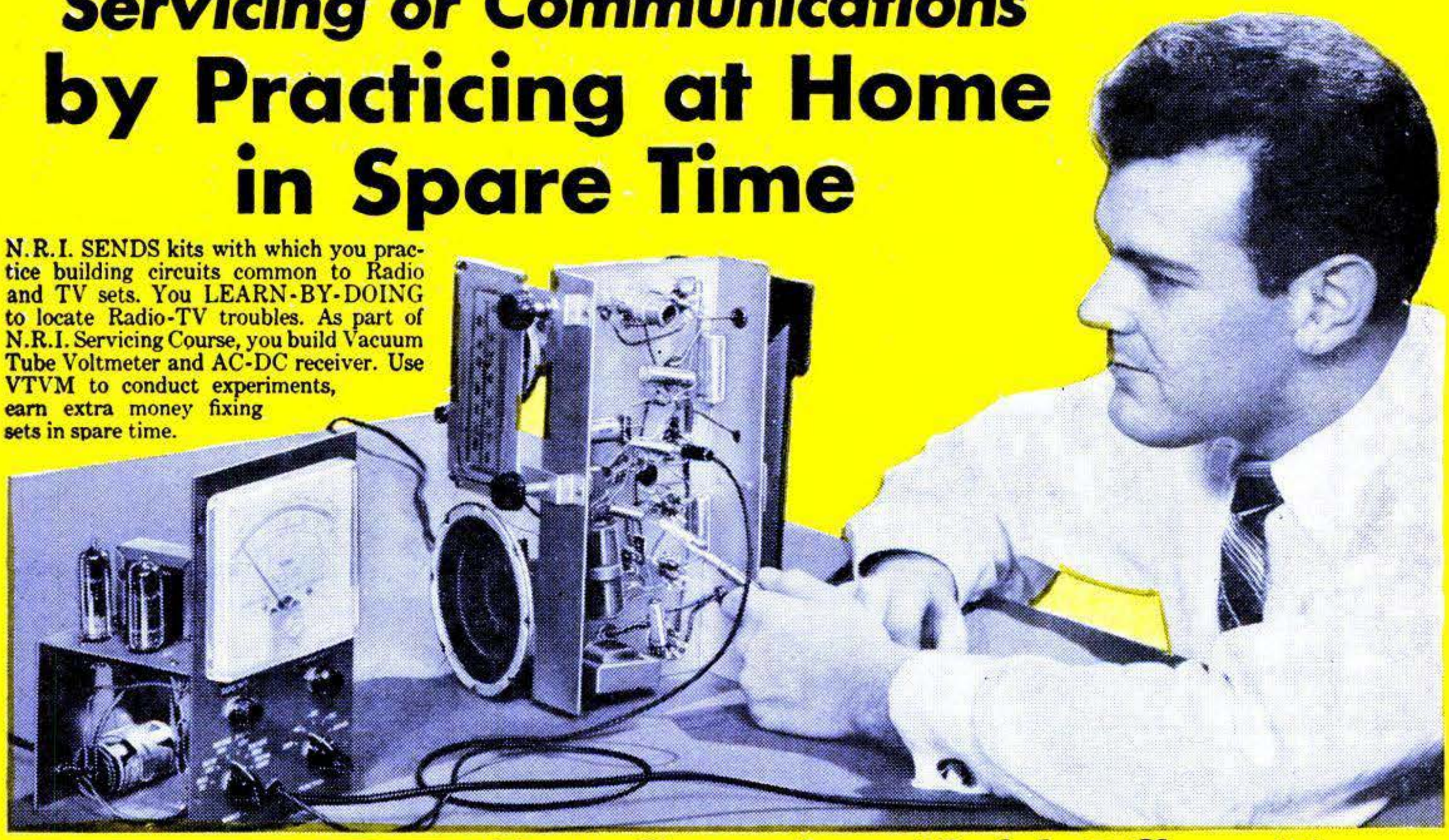

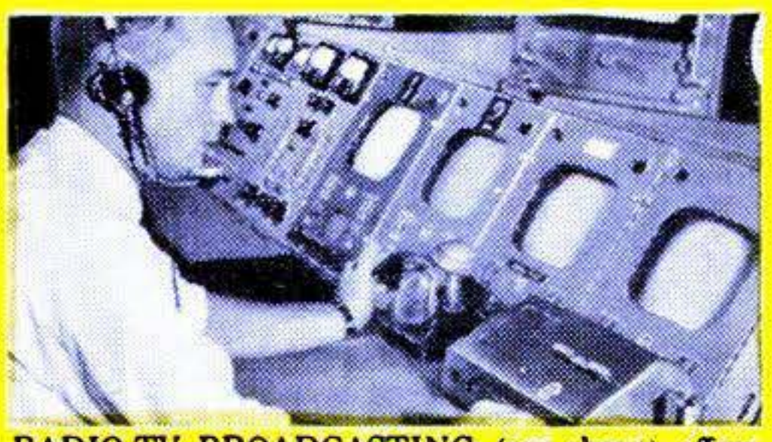

RADIO-TV BROADCASTING (see above) offers important positions as Operators and Technicians. RADIO-TV SERVICING Technicians (see below) needed in every community. Their services are respected, their skill appreciated.

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J. E. SMITH
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The month in science

Back to DC? It's a good bet for some power tools and home appliances. The reason: a significant development in rectifiers, the gadgets that let electricity flow in one direction only, to convert alternating current to direct current.

Newest ones are made of silicon, grayish element also used for transistors. Advantages: peanut size, reasonable cost, ample capacity (two amps and more), low power loss. That means they could economically be built into many machines.

Why DC? In your home, two reasons stand out. With DC:

1. Small motors run more efficiently, could be made even smaller. Their speed could be controlled more easily and accurately (a simple rheostat adjusting the field current would do it).

2. Relays, essential to many appliances, would be simpler to make, would operate more surely and more quietly.

Among the developments you can expect—not this year or next but before too long:

- A variable-speed electric drill. You'd run it slow for heavy boring, fast for sanding.
- Very precise speed control on lathes and possibly table saws.
- Lighter, more efficient vacuum cleaners, sewing machines, food mixers.
- Quieter washing machines, dryers, dishwashers (no relay chattering; their motors would probably continue to use AC).
- A simple, inexpensive battery charger for your car.

All these things would plug into your present AC outlets—the rectifiers would be built into the machines themselves, the way they are now in TV sets.

Main drawback: cost. Today, rectifiers for a drill would run about $10. The outlook is bright, though. The things are very new. Hughes Aircraft, for instance, dropped the price of one of its silicon rectifiers by more than half in the last 18 months.

Is radioactive fallout a real hazard? Or isn't it? The experts keep contradicting each other.

Last summer the U.S. Congress Joint Committee on Atomic Energy decided: Continued atomic testing at the average of the past five years *could* be a hazard (PS, Dec., p. 21). This fall scientists advising the AEC concluded almost the opposite.

How come? One reason: simple lack of knowledge. Scientists don't know what fallout's extra smidgen of radioactivity will do to human beings. Teasing puzzles crop up. For instance:

Atomic radiation from natural sources (radioactive rocks and cosmic rays) has always been around. But this natural radiation isn't the same everywhere. Some people get a lot more than others.

In India, a 100-mile stretch of coastline is spotted with patches of very radioactive monazite sand. More than 100,000 people live

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there. Some may be exposed to 50 times as much radiation as the average person is.

In Sweden, masonry houses are made from radioactive clays and sands. Inhabitants get four times the radiation they would out-of-doors.

In mountainous areas, people are subjected to three times more cosmic rays than people who live at sea level.

Does this sharp difference in radiation make a difference in the people? Are more of their babies born defective? Are their cancer rates higher? Do they die younger?

Answers to such questions may turn up The Answer on fallout.

Sunspot record. Scientists picked a winner when they chose 1957-58 for the International Geophysical Year. One consideration: an expected peak in sunspot activity. They got it.

The count has already hit an all-time high, greatest in the 200 years records have been kept.

What's the difference? Nobody knows just what sunspots are, but everybody agrees they're important. The known facts:

- Sunspots are dark areas on the sun (that is, darker than the rest of the sun though very bright by earth standards).
- They come as big as 50,000 miles across.
- They often have very concentrated magnetic fields.
- They eject "flares" of very hot gas that streak out hundreds of thousands of miles at speeds up to 500 miles per *second.*
- They run in cycles, with peaks every 11 years or so.
- They alter the earth's magnetic field. This affects radio, telephone and telegraph communication.

Do they also affect human affairs? Many people think so. Sunspot cycles have been linked to juvenile delinquency, divorce rates, political troubles, business activity.

It could be: The stock market fell apart last fall, and the French were having a devil of a time organizing a cabinet.

Scientists are swinging at the golf ball again. Object: to cut down on the advantage heavy hitters now have.

American Golf Association has commissioned Arthur D. Little, Inc.—the research consultants—to redesign the ball so that:

1. It won't travel so far as the present model when walloped by the long-drive experts.

2. It will travel as far as the present model when hit by the average golfer.

Besides evening up the game, the deader ball will save present courses. They aren't designed for long, long drives, and can't easily be expanded.

Martin Mann

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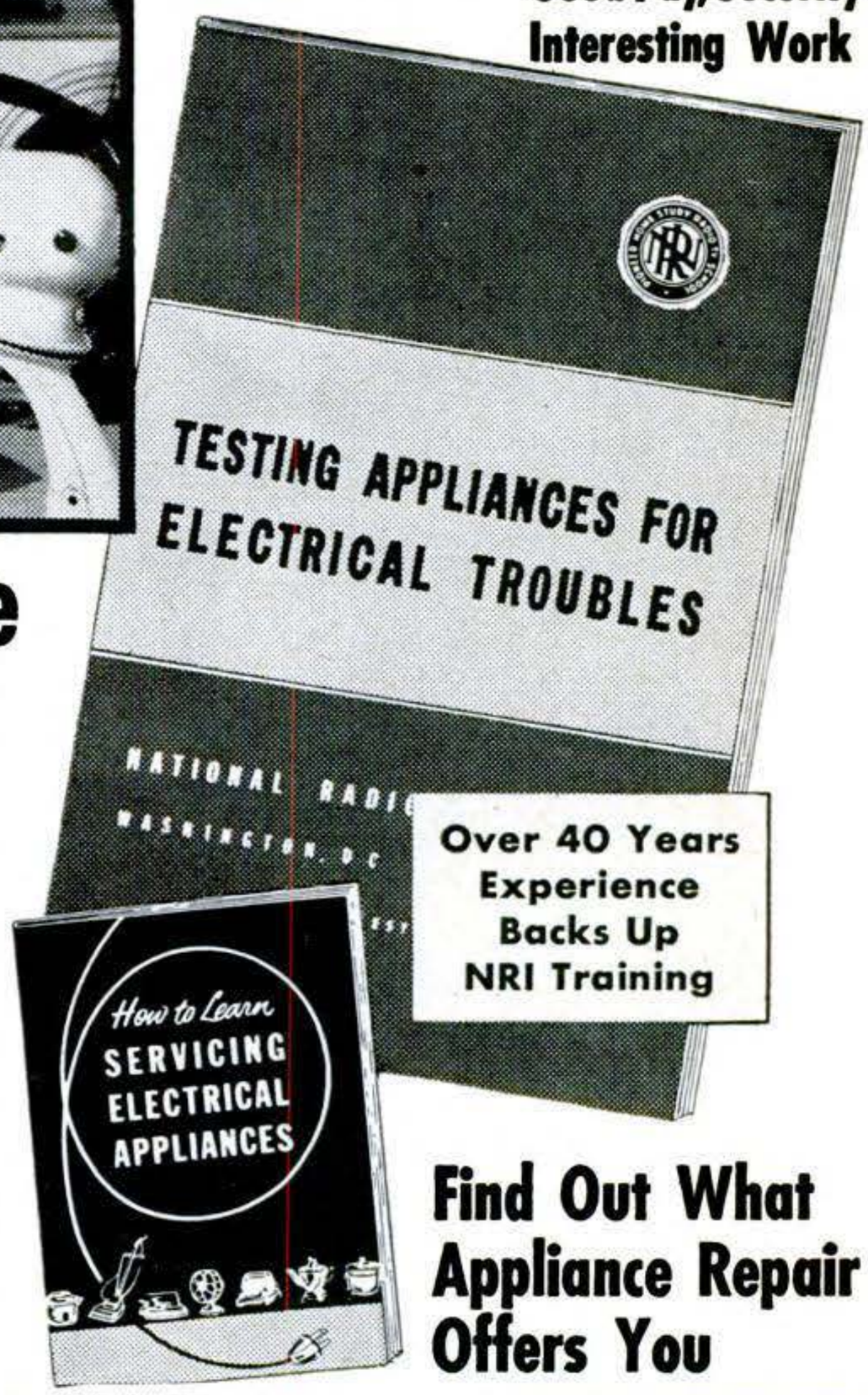

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Keeping the Home Shipshape

A FLUORESCENT SHOP LIGHT will keep house plants thriving during the winter. Put a box on the bench to lift the plants a foot below the lamp, and "sun" them periodically for 14 to 16 hours.

A CLOTHES POLE WON'T SLIP if a line resting in the notch is gripped by a spring clothespin. Run a screw or 6/32" machine bolt through the spring to fasten the pin to the pole.

GOT A FOOT LOCKER hidden away somewhere? Team it up with a low bedroom chair and you have a chaise longue with storage space for sheets and blankets. Just pad the top of the box with foam rubber to build it up in height to match the chair. When both pieces are slip-covered, nobody will suspect the barracks background of the oversize footstool.

DRIP-DRYING CLOTHING IS EASY if you put a second shower-curtain rod midway across the tub's width. For a removable rod, use a telescoping closet rod with suction-cup ends.

A SLOTTED PLATE RAIL for wall or pantry shelves can be made from a flat curtain rod. Screw the sections at the rear of the shelf, rolled edges up, and prop the plates in them.

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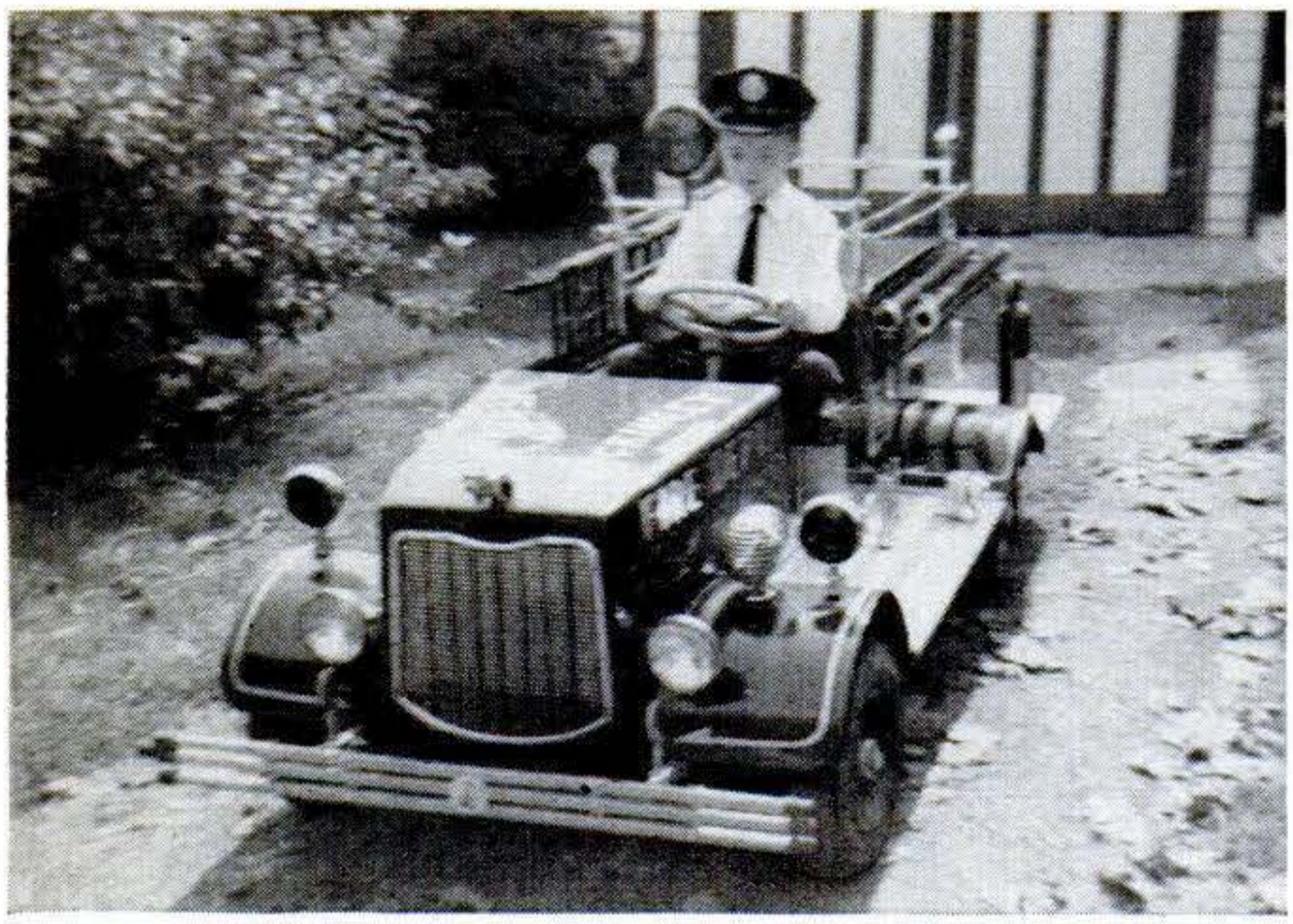
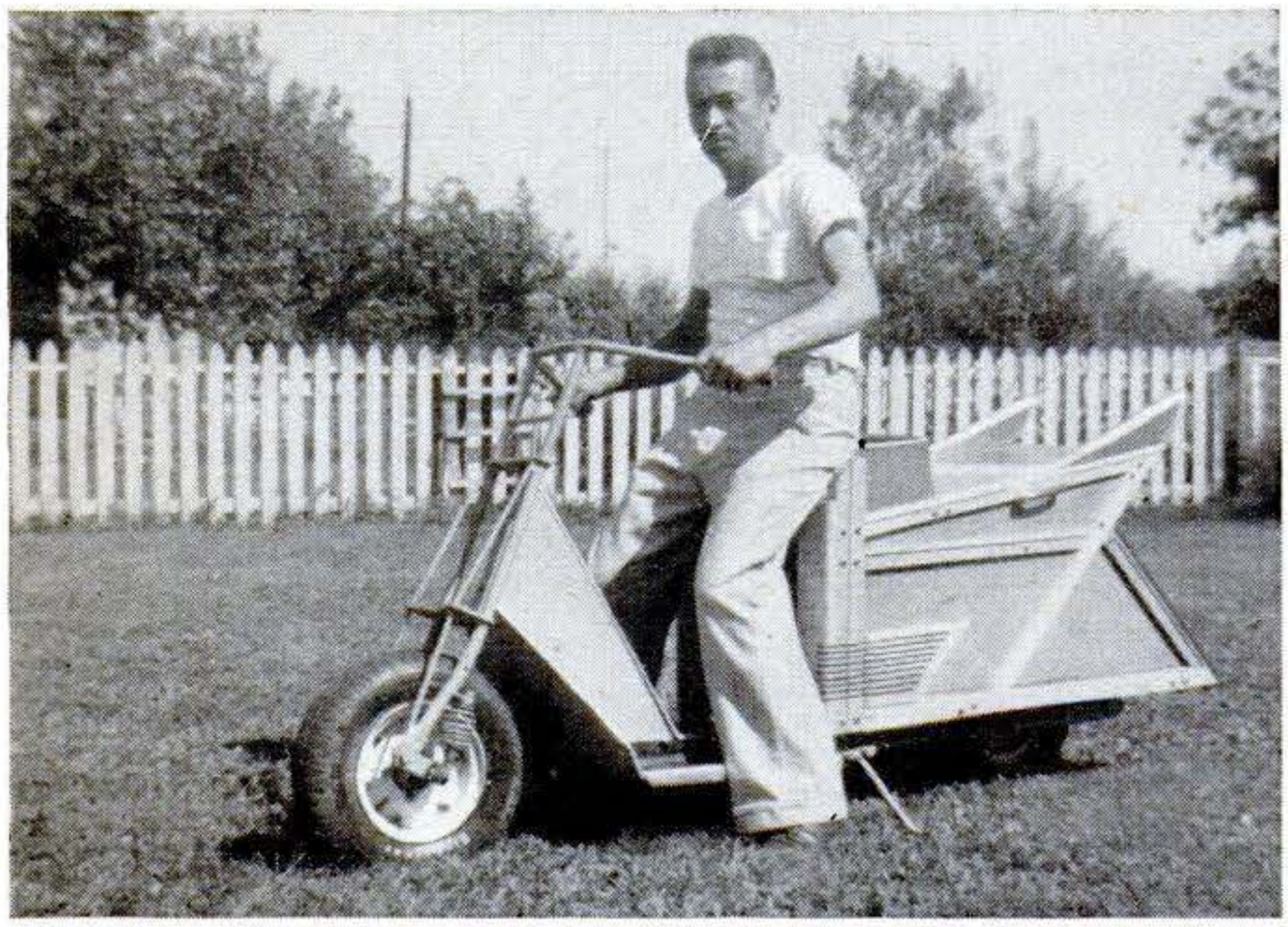


Pint-Size Pumper. Big buffs and small go for this midget fire truck when it heads parades in and about Elkins Park, Pa. Driven by a 4½-hp. scooter engine, the pumper represents three years of spare-time work by Edward S. Croft.

Working accessories and gear include everything from warning blinkers, siren and searchlight, to ladders, hose and hand extinguisher. Also, get a load of that slick paint job.

Desk from Cherry Tree. Eighty-two-year-old Charles Kelly of Borden, Ind., bought a cherry tree in 1950, had it sawed into lumber, and let it air-dry for seven years. Now he has shaped it into this handsome desk and chair, finished with clear varnish to accent the color and grain of one of the most beautiful of hardwoods.

Artisan Kelly also made the violins, using maple from a tree he felled in 1915, and very old imported spruce for the fronts.



Swept-Wing Scooter. Probably the first motor scooter with station-wagon styling, this remodeled Cushman job is the handiwork of Nicholas Ritter of Worth, Ill. The fish-tailed engine hatch was built up from Samara plywood, trimmed with hard maple and finished with several coats of hand-rubbed, clear varnish. Nick makes no claim that the fins add stability.

Have *you* recently completed a workshop project of which you are particularly proud? Send a good photograph of your work, along with the negative and a brief description, to the Mechanics and Handicraft Editor, POPULAR SCIENCE, 353 Fourth Ave., New York 10, N. Y. We will pay $15 for each item that is accepted for publication.

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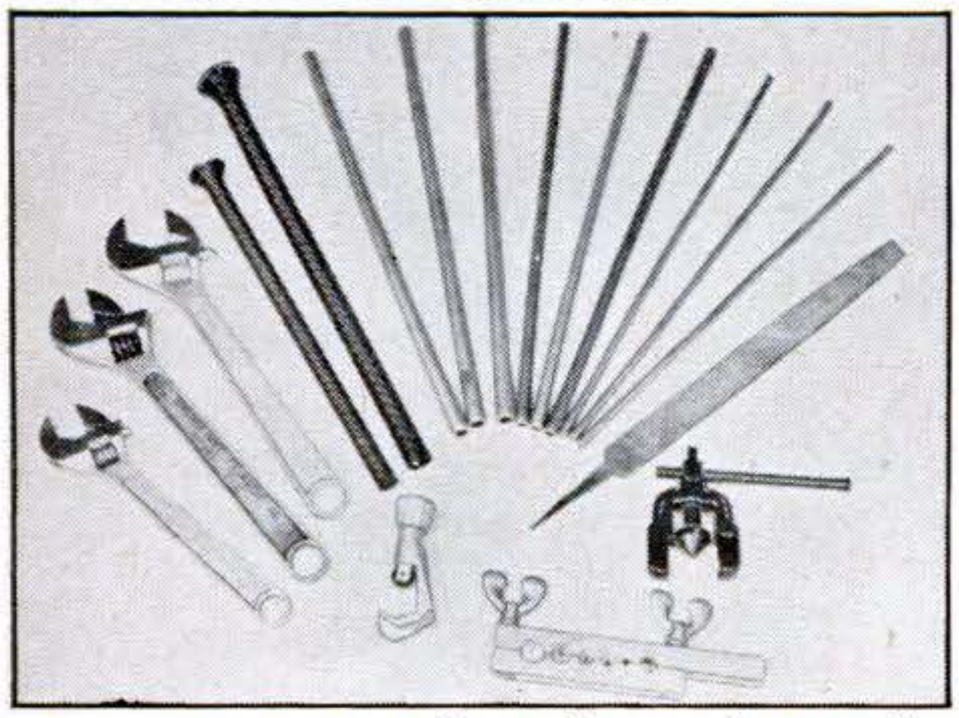

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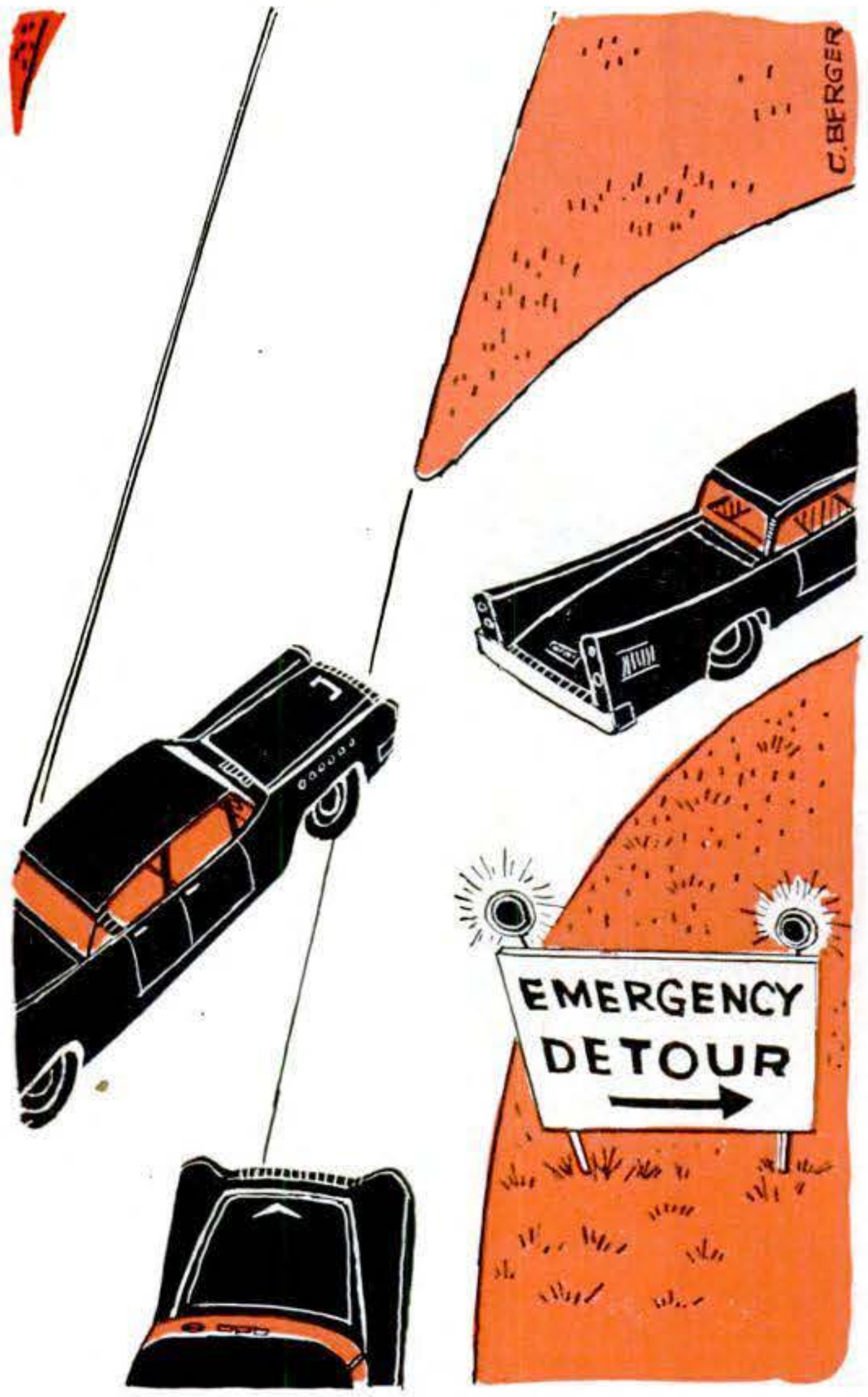
"I'd like to see them make..."



ROAD-BLOCK WARNING LIGHTS on throughways for use when accidents or fires stall traffic. Drivers could then be alerted miles ahead to take the next exit.—*Stephen Samuels, Boston.*

ONE-STEP STARCH YOU COULD SPRAY on a collar or curtain and iron dry. Soaking, hanging up items and waiting for them to dry would be eliminated.—*D. Davan, S. Ozone Park, N.Y.*

WORK GLOVES with transparent plastic cuffs (or one such cuff) so that you could tell time on your wrist watch without taking off the glove. —*David Chamberlain, Butte, Mont.*

A BOTTLE-DECAPPING DRAWER HANDLE. An opener stored inside a drawer is hard to find, and besides, our kitchen is disappearing under wall-hung gadgets.—*John Teachman, Lincoln, Nebr.*

A PLUG-IN JACK in the horn circuit at the base of the car's steering column, clearly marked "horn." Yanking out the jack would silence a stuck horn.—*F. W. Edwards, Columbus.*

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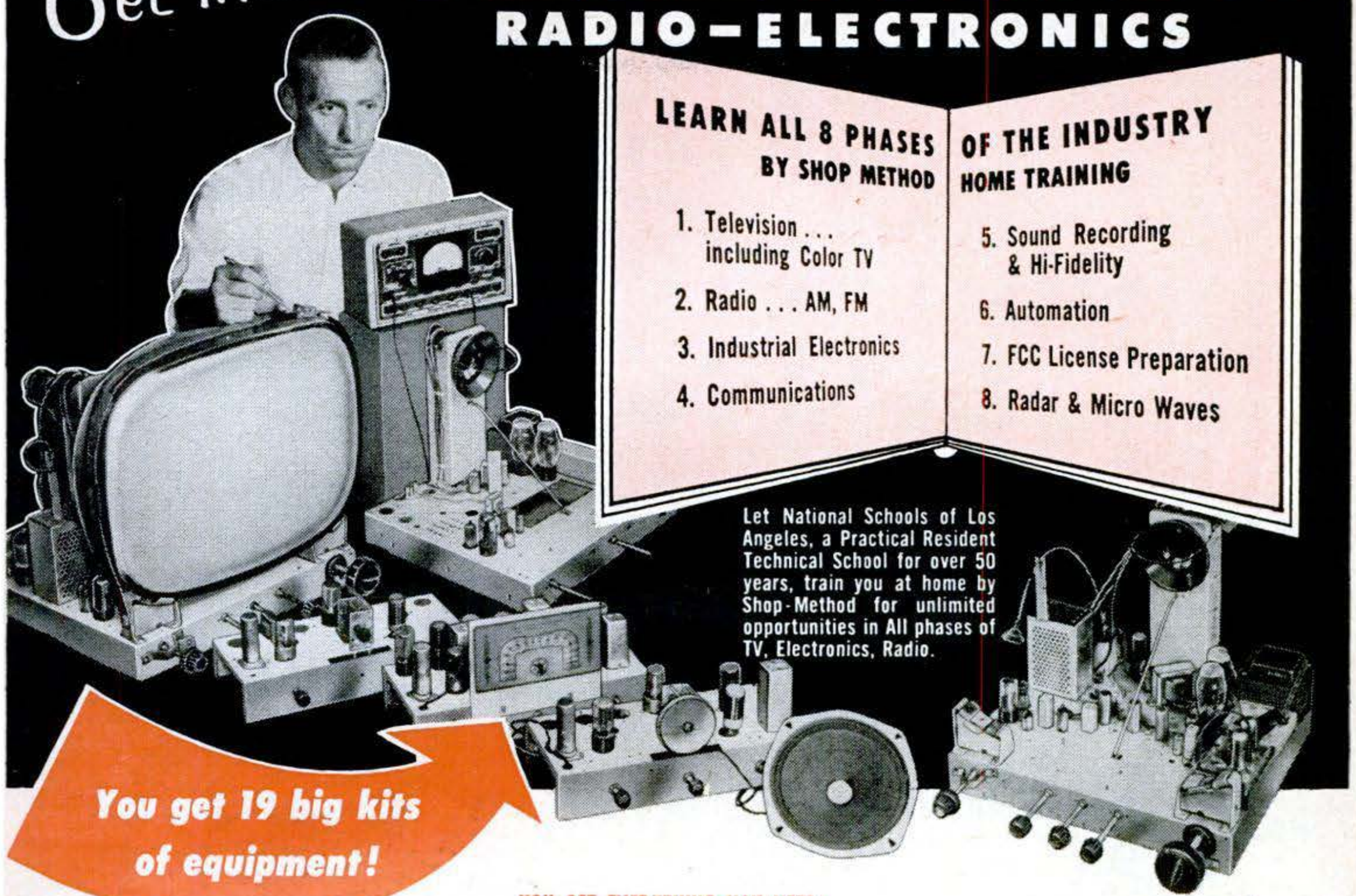

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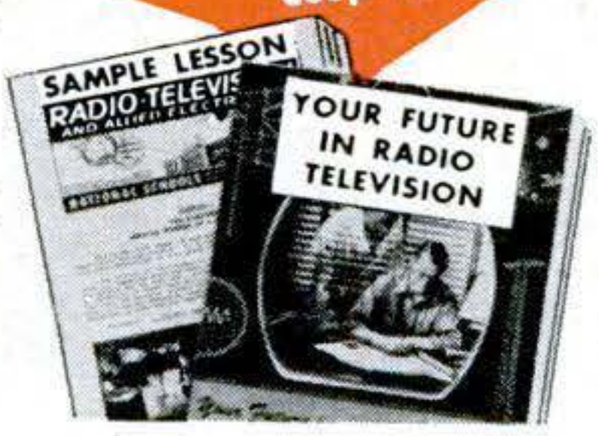

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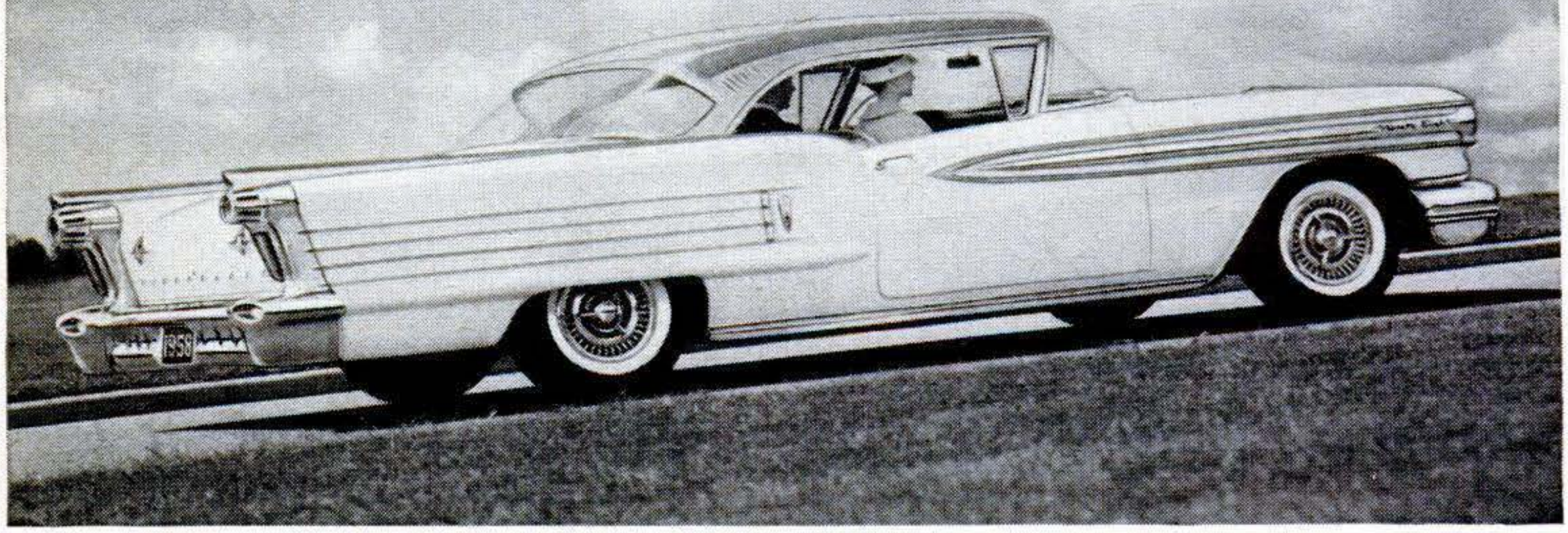

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1908-1958 GM FORWARD FROM FIFTY...INTO THE ROCKET AGE

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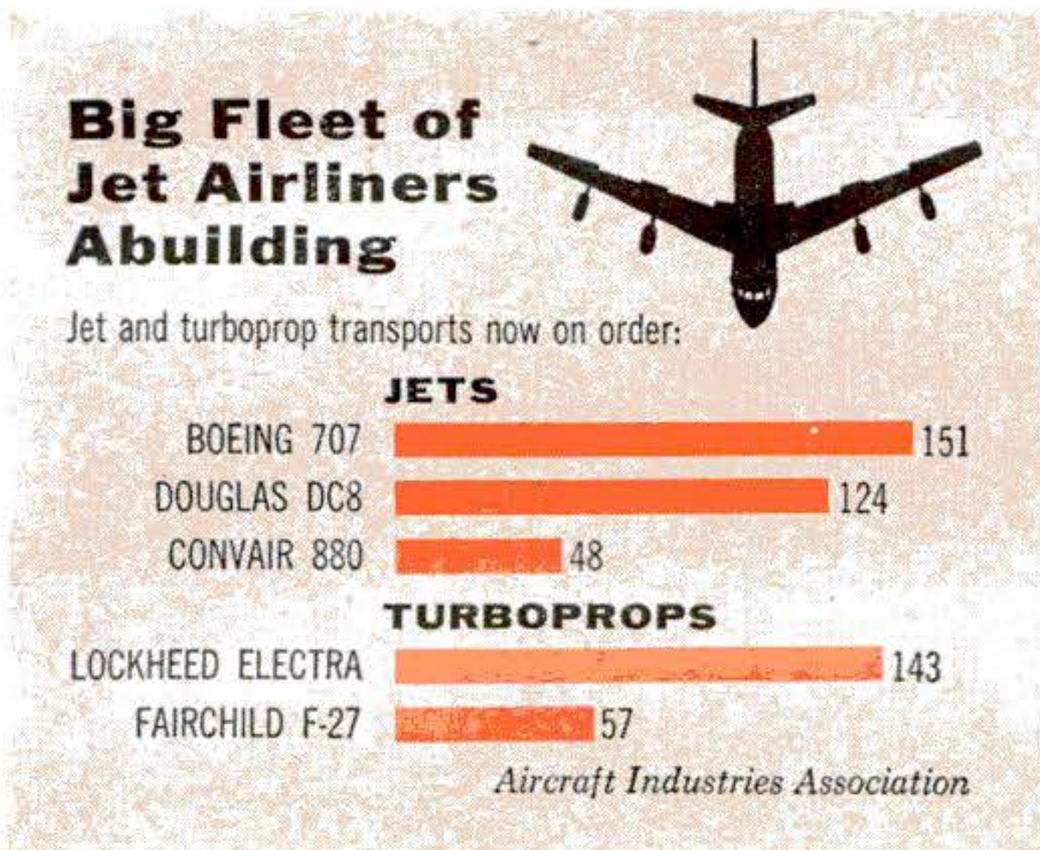
You ought to know...

Will you be able to ride an American jet this year? Maybe. The U. S. is catching up—slowly—with Britain and Russia in building jet craft for passengers. This much is sure: By fall you'll be flying in made-in-the-U.S.A. turboprops: planes with jet-type turbine engines that drive propellers. Pure jets, American ones, are to go into service by January, 1959. Besides their time-trimming speed, you'll notice less vibration, a quieter ride than you get in today's piston-engine planes.



Plane builders' contracts tell the story: firm commitments from the airlines for 523 jet craft (see chart), and tentative orders for many dozens more.

Contrast this with piston-engine airliners: Fewer than 300 are on order. The figures signal their slow but inevitable disappearance into history.

U. S. jet progress has hardly been sonic. England was first but abruptly grounded with the De Havilland jet Comet. Russia is now flying both jets and turboprops—the latest, the 120-passenger TU-114, complete with two interior elevators. And the English Viscount turboprop made by Vickers-Armstrongs is in service all over the world, including the U. S.

Counting on today's lumber prices to stay low? Be careful about that, in deciding when to build a house or addition. Bear this in mind: The same situation that puts the cost of lumber on your side right now can change overnight.

It's true that mill prices for lumber and plywood have been soft for months. In some of the largest cities—Chicago, Detroit, Philadelphia, New York, Los Angeles, San Francisco—competition is keen among jobbers who supply many of the retailers. Here, retail prices closely reflect the price dip at the mills.

Big-city dwellers and those in areas where competition is sharp may save some money by shopping around. Be on the lookout especially for the so-called framing lumber: two-by-fours, planks, boards, sheathing plywood, and the other types that go into framing a house. Prices are still down on finished lumber such as moldings, shelving and flooring. But they haven't dipped nearly as much as those for framing stock.

Take a list of what you need to two or three local lumberyards, and get their prices item by item. A big job requiring a carload or over may get you further price concessions.

What could cause the lumber-price pattern to change suddenly?

Something called "housing starts." Home building slid off in 1956

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You ought to know...

and most of 1957. The demand for lumber and plywood also fell.

The mills didn't cut their production fast enough. Their supplies piled up. The result: Prices that mills got from big buyers—contractors, jobbers and larger retail yards—dropped week after week.

So your key to lumber pricing is the number of homes that are begun each month—housing starts. (It's easy to check it. Many newspapers carry the monthly housing starts compiled by the U. S. Department of Commerce.) Housing construction has hovered around a million units over the past year. But that, it seems, is about the bottom of the current dip. New Federal Reserve Bank discount rates, making mortgage money easier to get, may put new zoom in the housing boom.

If housing starts swing up again, so will lumber prices—briskly.

Winter is the season for the gyp furnace expert. His phony sales talk is most effective when your heating bills get costly and start to pinch.

Beware of miraculous gadgets "guaranteed" to cut your fuel costs, the Better Business Bureau warns. One kind is supposed to recover waste heat from furnace flues. But New York City recently declared one such device unsafe because of the danger of escaping flue gases.

How to play safe: Check with a competent heating man before you experiment with flue-heat recovery.

Another trick, one that got a big play last year, can suck you in if you're caught off guard. An alleged furnace technician gives you a cut-rate price on fixing up your heating plant. Halfway through the job he announces alarming news: Your furnace isn't worth fixing. But he can give you a good deal on a brand-new one. So you're stuck and it's cold outside.

In the long run, a reliable furnace man can save you money. He can also save you the legal fees it would cost to bring the gyp operator to justice.

Buying a new car? You'll have to be sharper than ever if you want to stay out of the clutches of fast-buck auto dealers. Charges of unethical practices in both new and used cars during 1957 increased by 30 percent over 1956, an authoritative report says. Most flagrant sharp practice by unscrupulous dealers was the advertising of unavailable cars, at fantastically low prices, or of cars that the dealer had no intention of selling.

Beware, too, of price-packing, the custom of inflating the list price so that the dealer can *seem* to be giving you a bargain when he offers you a fat price for your old car.

For factory-recommended car and accessory prices, to help you swing a good deal, see page 117 in this issue.

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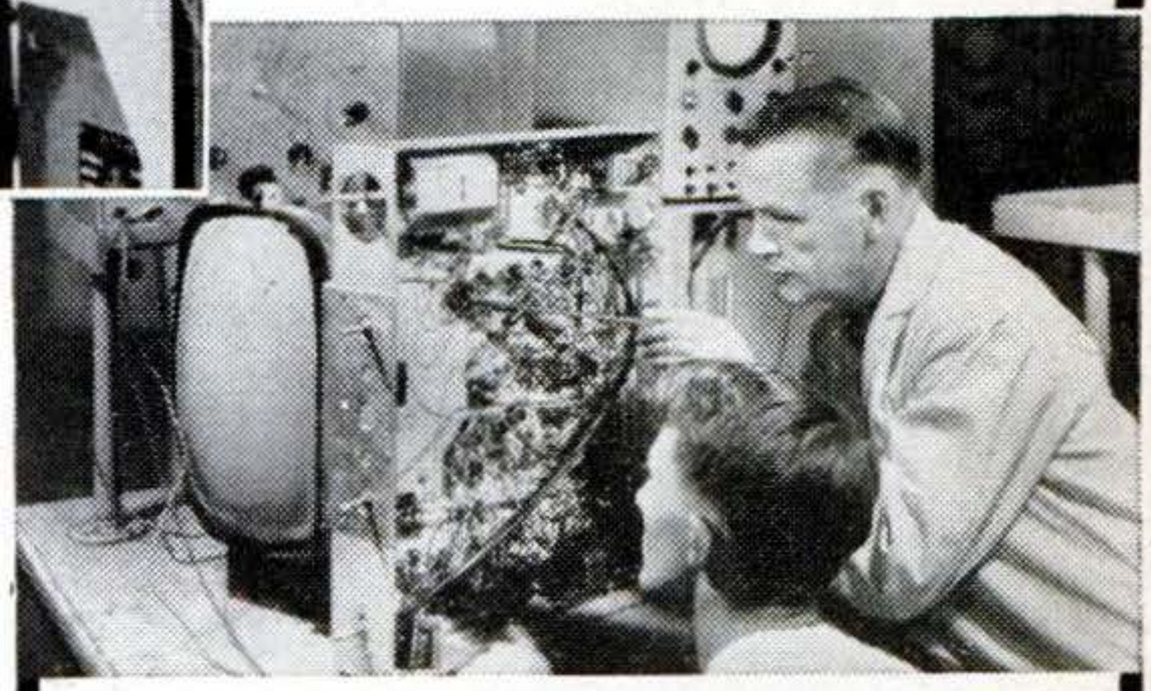

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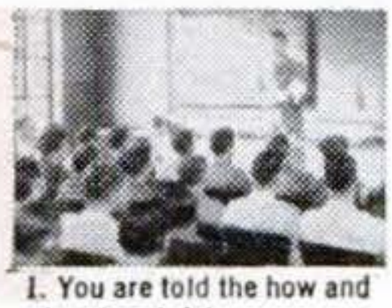

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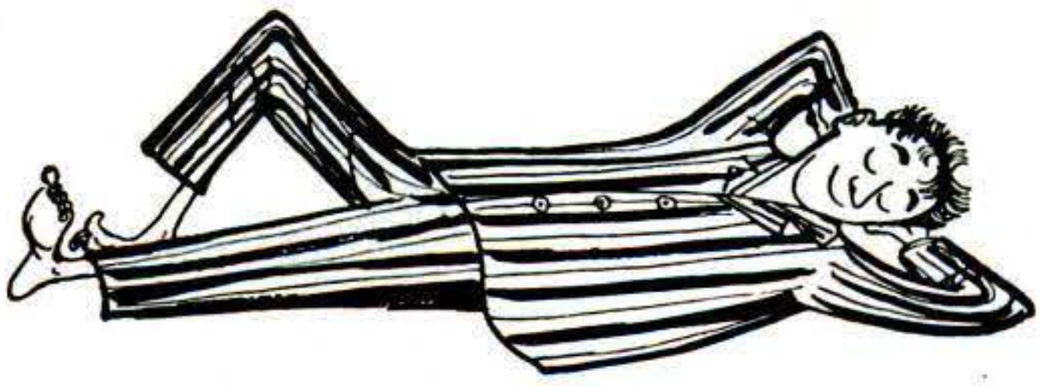

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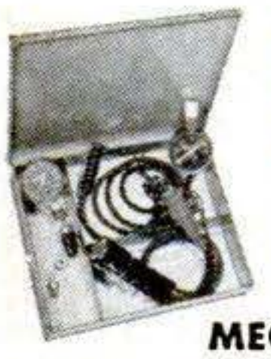

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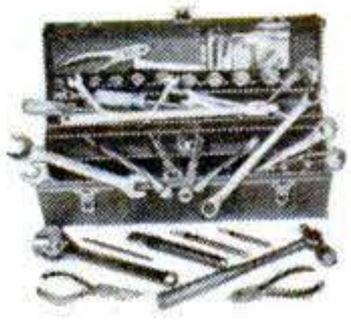

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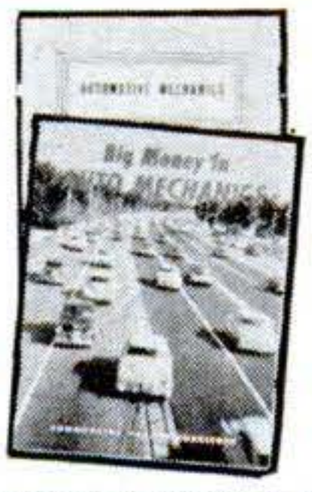

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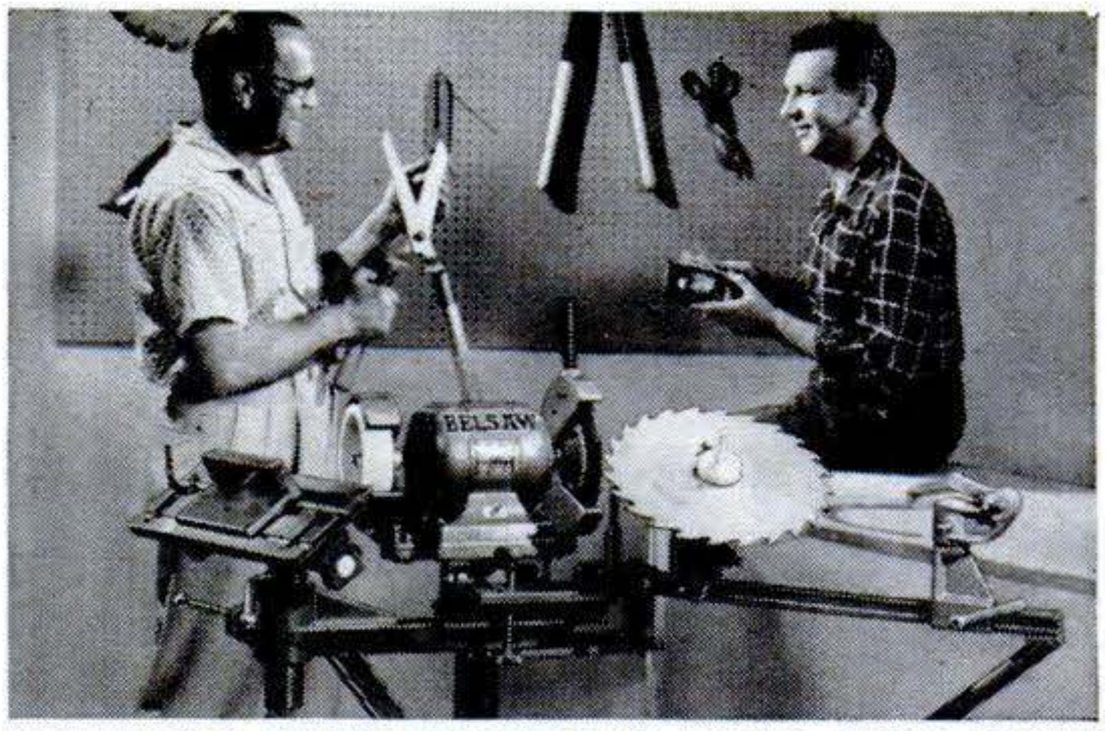

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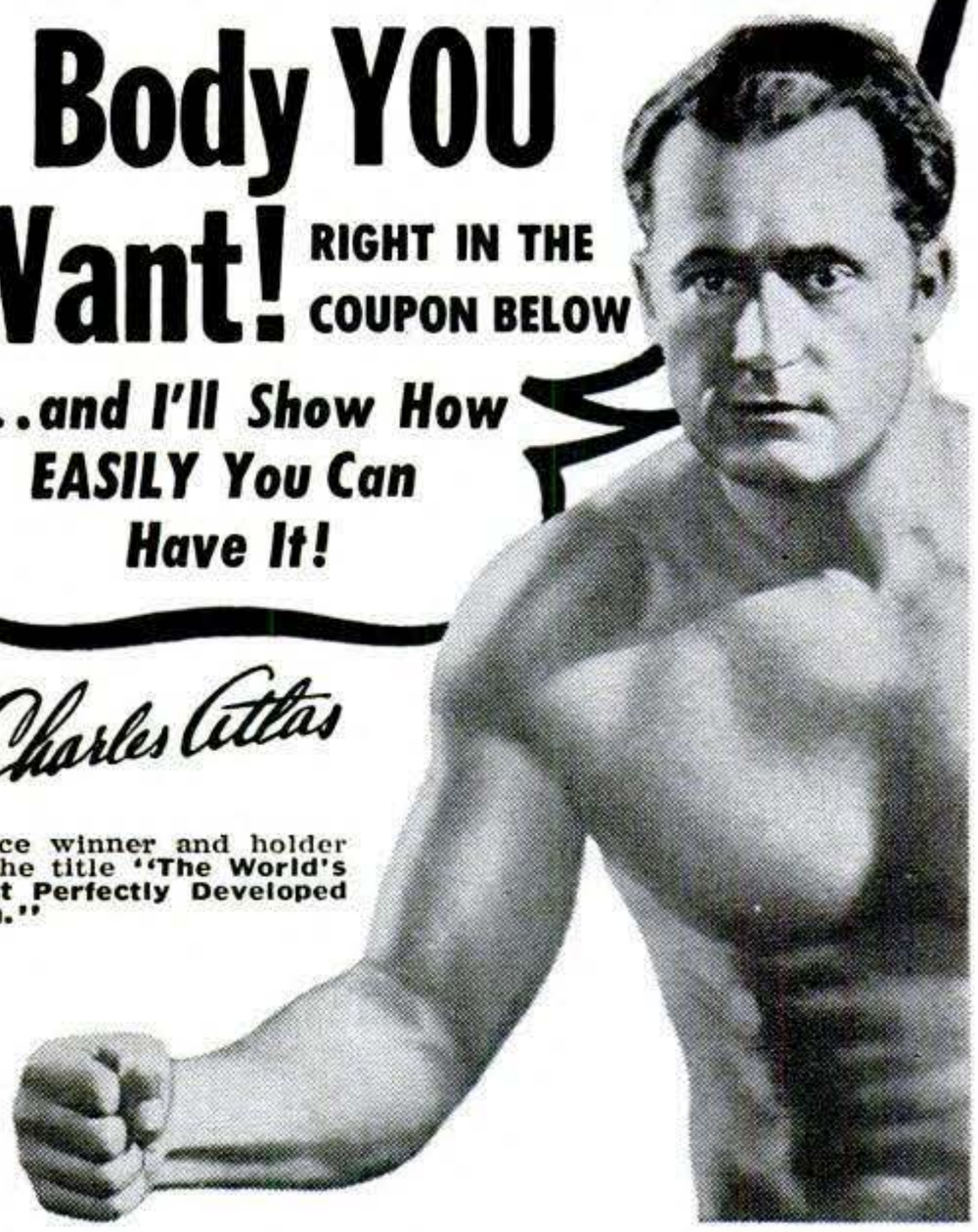

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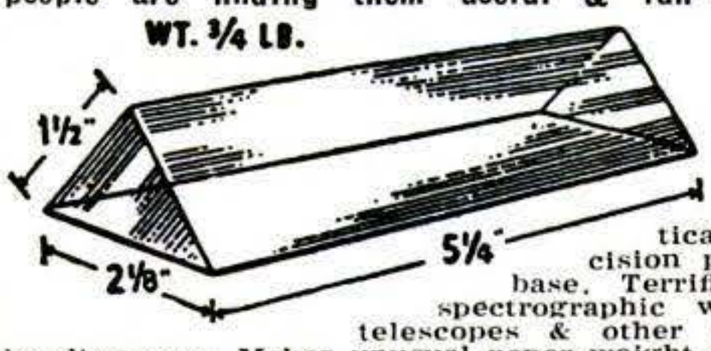

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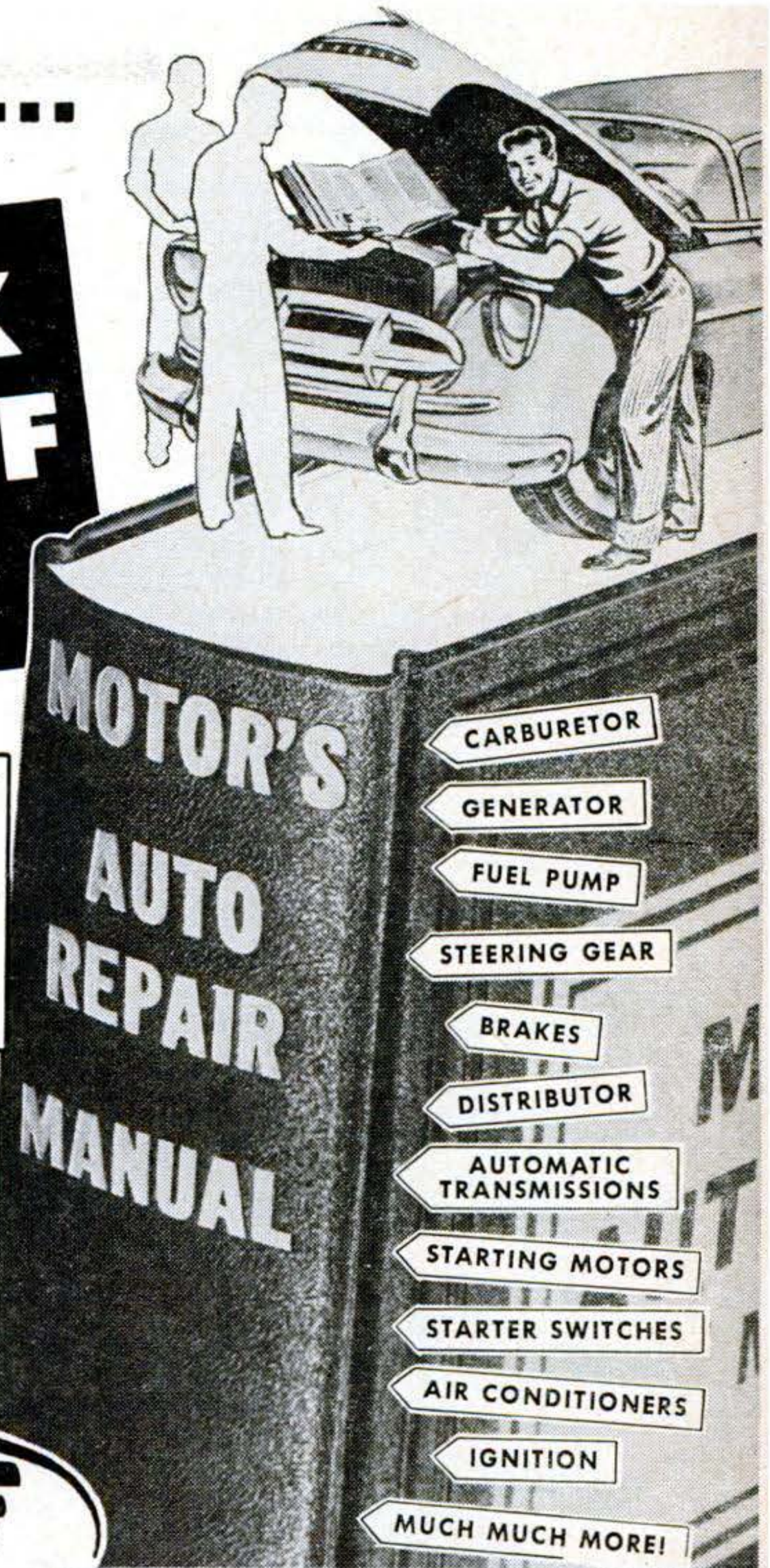

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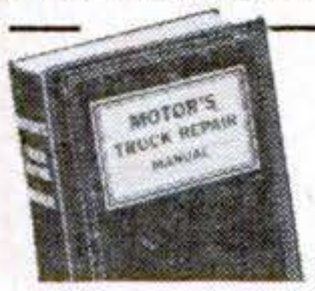

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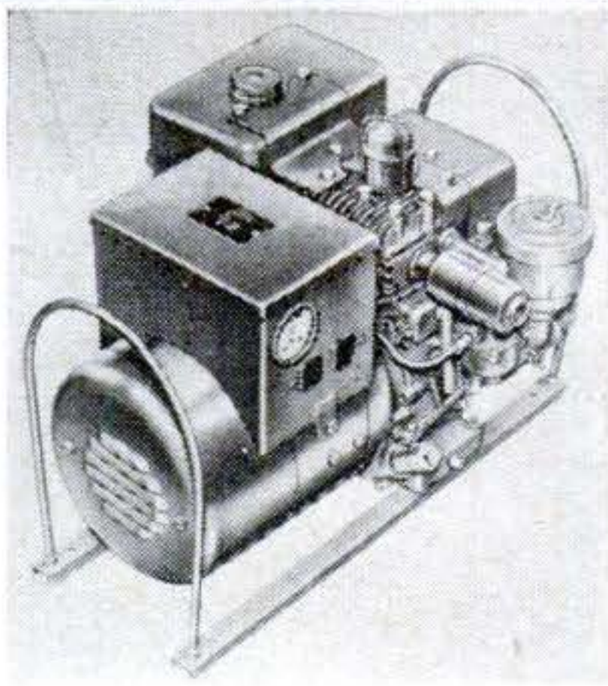

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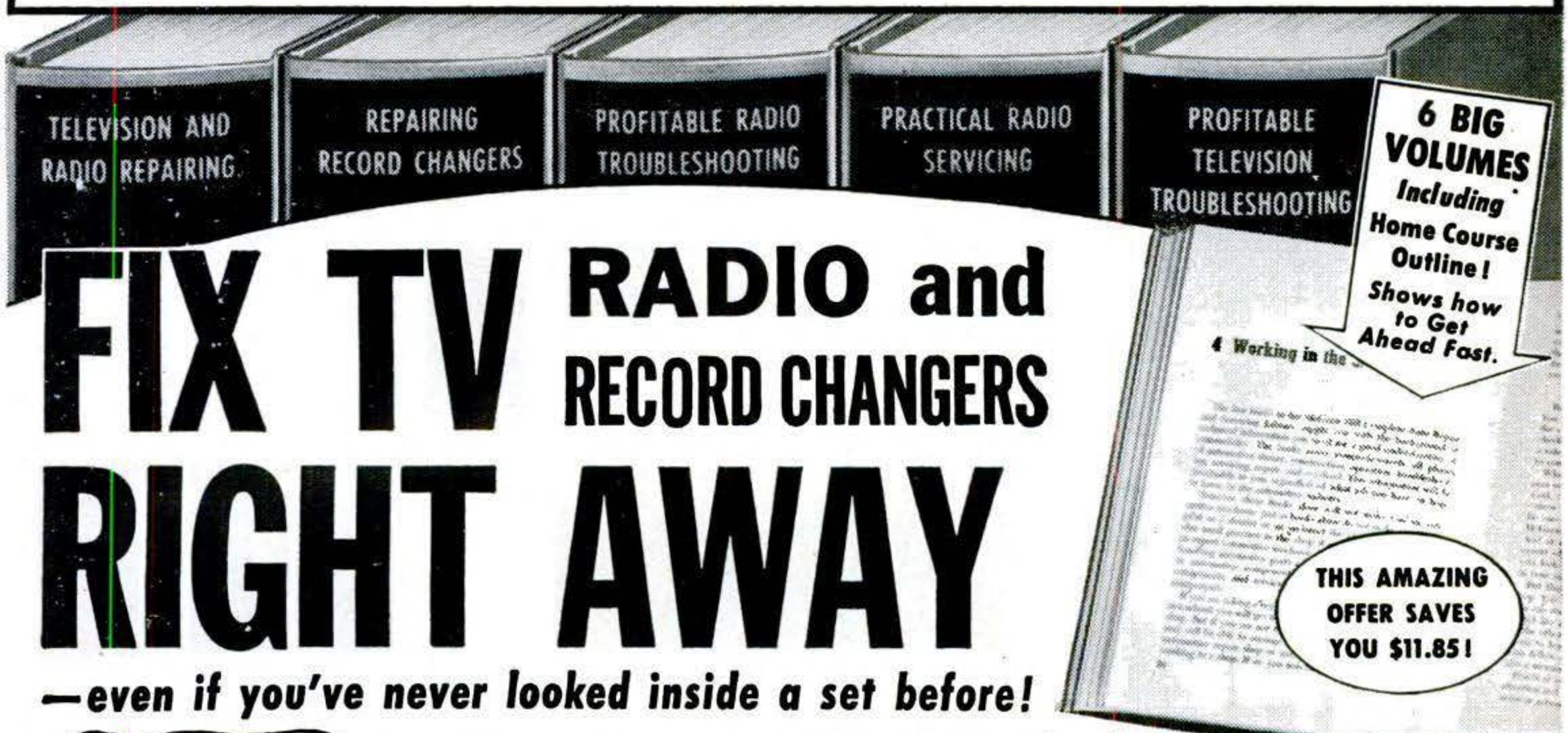

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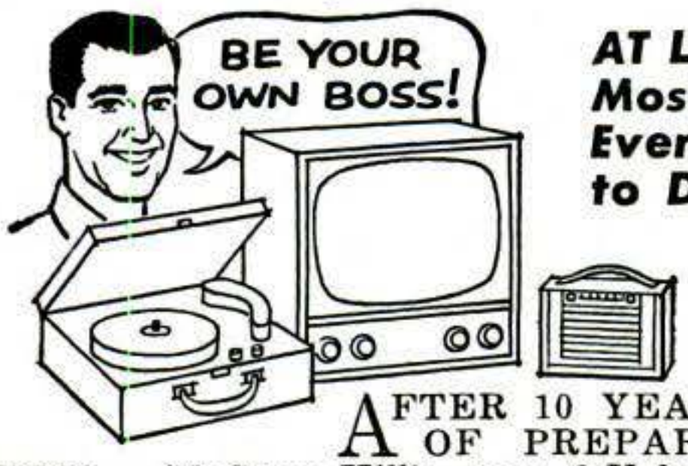

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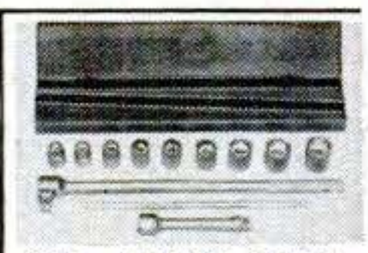

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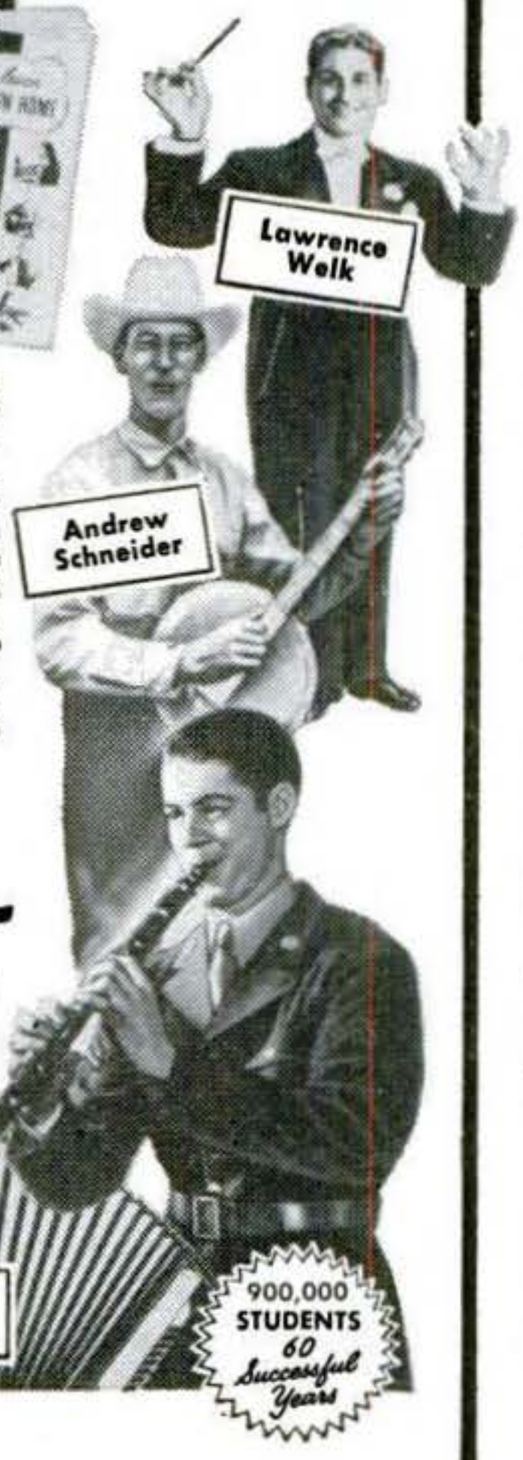

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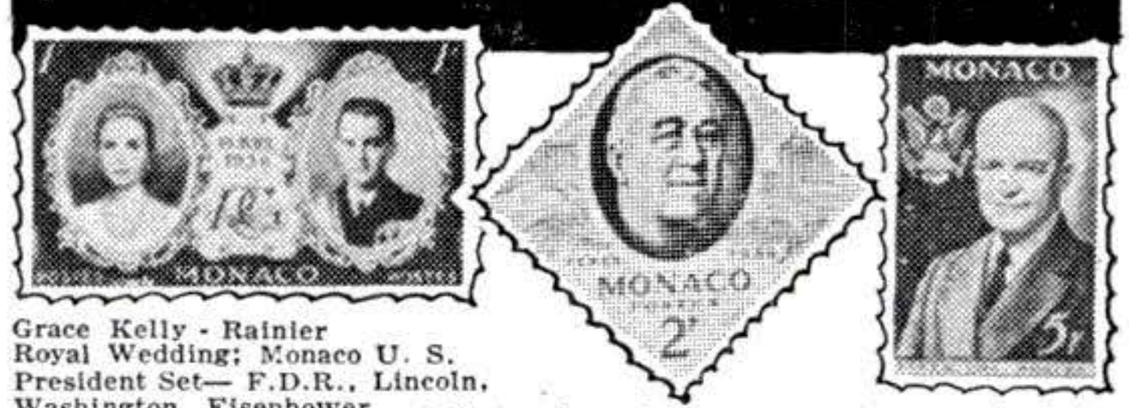

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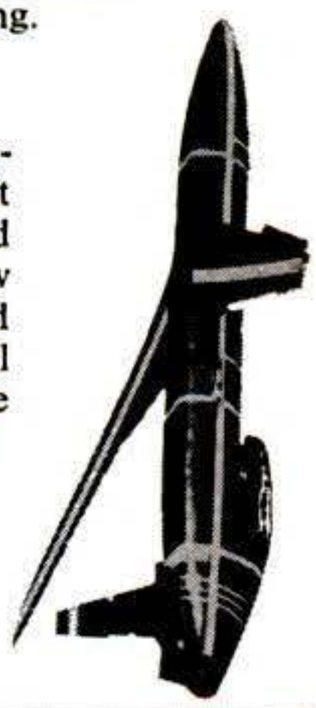

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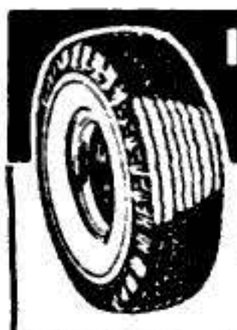

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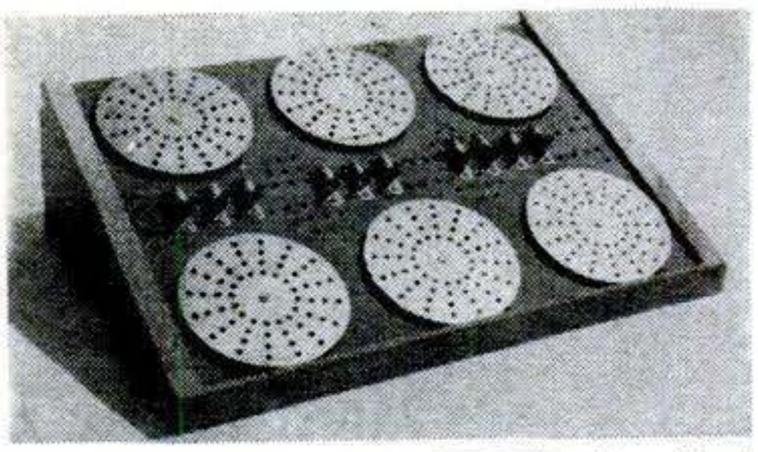

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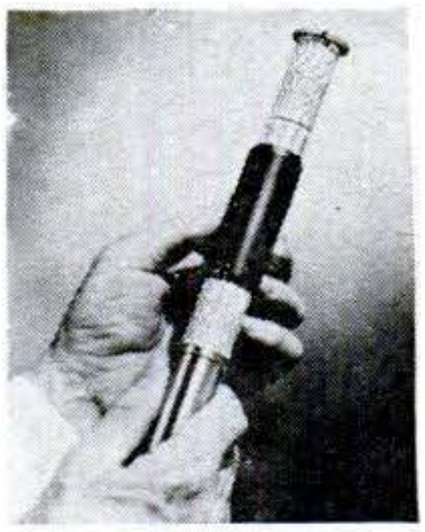

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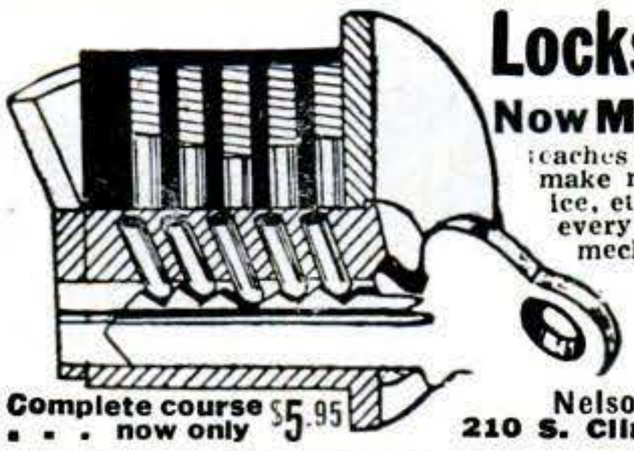

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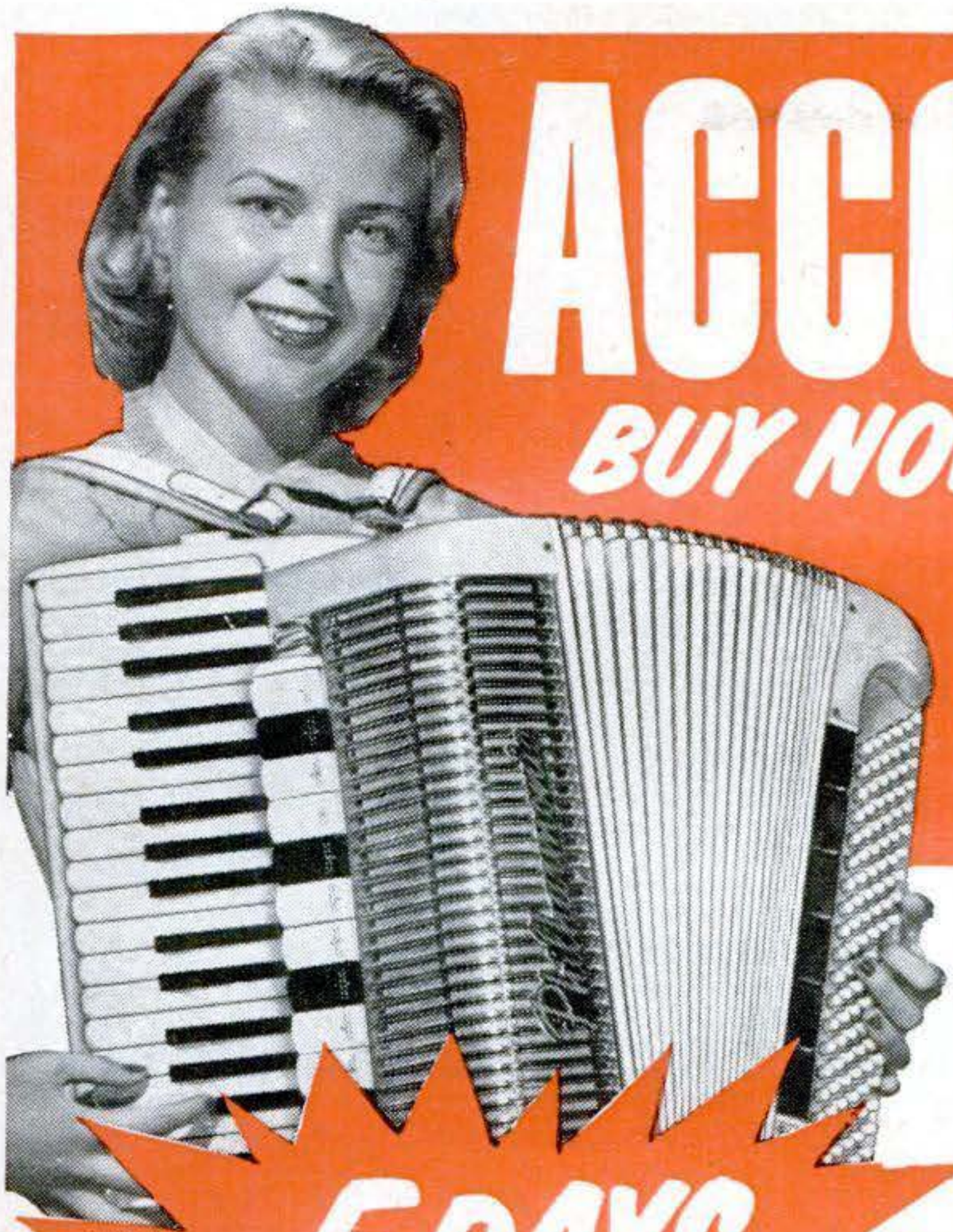

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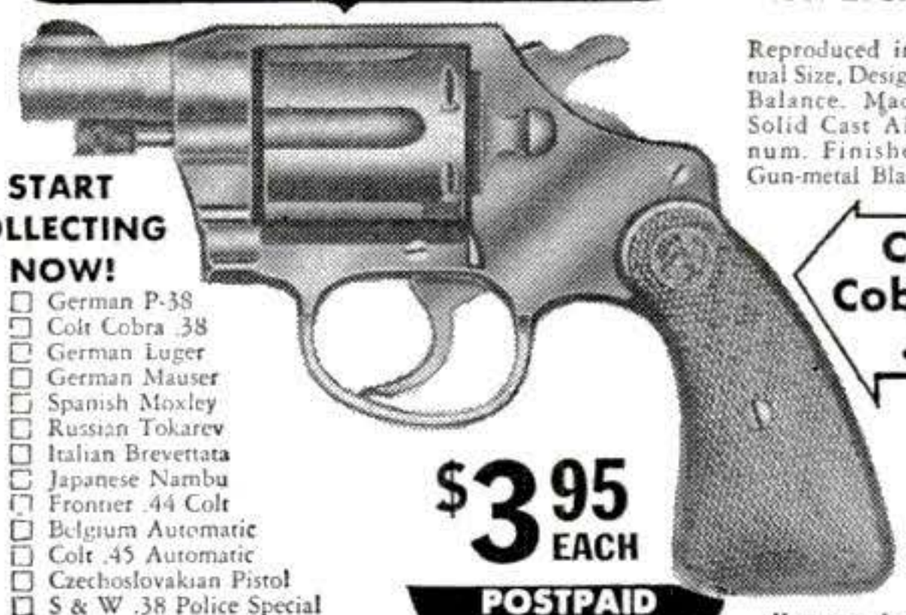

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650-16(6)	6.45	760-15	5.45	750-17	12.75	900-20	18.75
700-16	6.25	800-15	5.75	650-20	10.75	1000-20	17.95
750-16(6)	7.45	820-15	5.75	32x6(8)	10.35	1100-20	17.95
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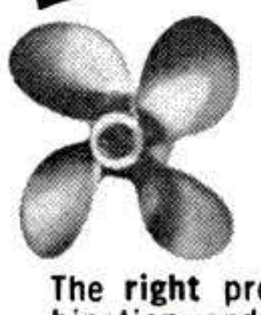

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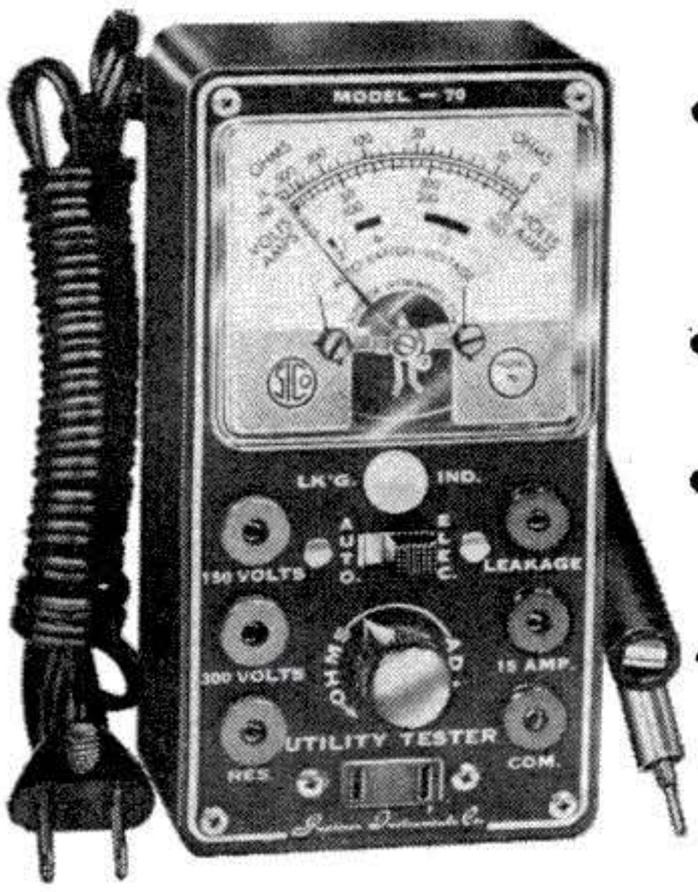
Superior's New Model 70 UTILITY TESTER®

FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS • AUTOMOBILES • TV TUBES



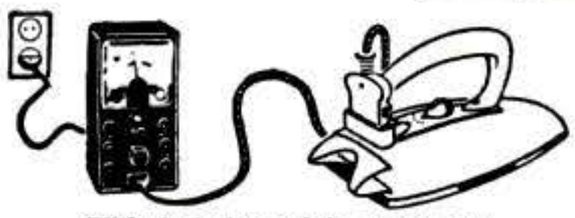
As an electrical trouble shooter the Model 70:

- Will test Toasters, Irons, Broilers, Heating Pads, Clocks, Fans, Vacuum Cleaners, Refrigerators, Lamps, Fluorescents, Switches, Thermostats, etc.
- Will test *all* TV tubes for open filaments, inter-element shorts, burned out tubes, etc.
- Measures A.C. and D.C. Voltages, A.C. and D.C. Current, Resistances, Leakage, etc.
- Will measure current consumption *while the appliance under test is in operation.*
- Incorporates a sensitive direct-reading resistance range which will measure all resistances commonly used in electrical appliances, motors, etc.
- Leakage detecting circuit will indicate continuity from zero ohms to 5 megohms (5,000,000 ohms).

As an Automotive Tester the Model 70 will test:

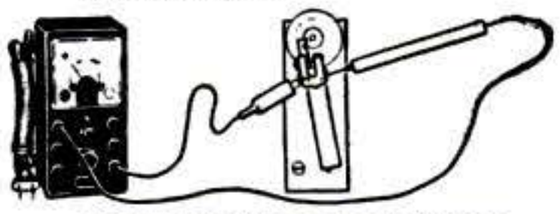
• Both 6 Volt and 12 Volt Storage Batteries • Generators • Starters • Distributors • Ignition Coils • Regulators • Relays • Circuit Breakers • Cigarette Lighters • Stop Lights • Condensers • Directional Signal Systems • All Lamps and Bulbs • Fuses • Heating Systems • Horns • Also will locate poor grounds, breaks in wiring, poor connections, etc.

IT'S SO EASY!!

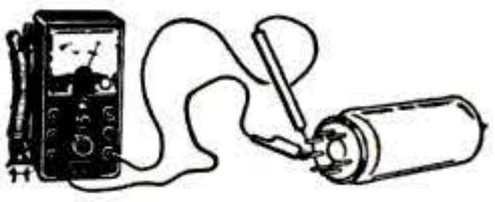


With tester's cord in outlet, current consumption of appliance is read direct on meter when line cord is connected to receptacle on panel. This typical iron takes 7 amperes (Good).

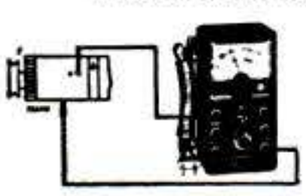
Small electric fan motor indicates 50 ohms (normal resistance).



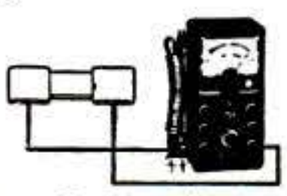
Control circuits of most furnaces use 24 volts obtained from step-down transformer. Here's how to check room thermostat to see if wires to it are live.



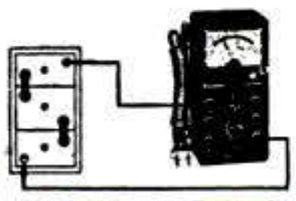
Manual supplied with Model 70 shows meter needle moves to right when test leads are connected to pins 3 and 4 of this 6AU6 tube. Procedure for testing all tubes used in TV are detailed in manual.



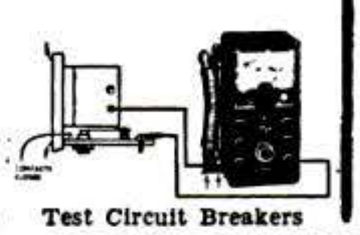
Test Generators



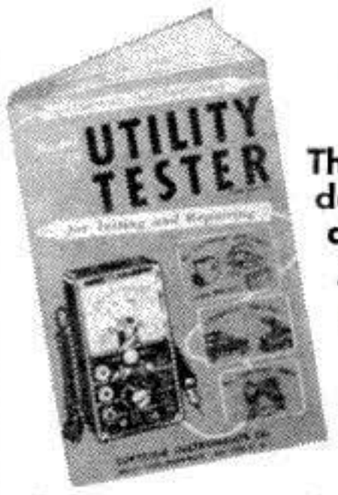
Test Auto Fuses



Test Storage Batteries



Test Circuit Breakers



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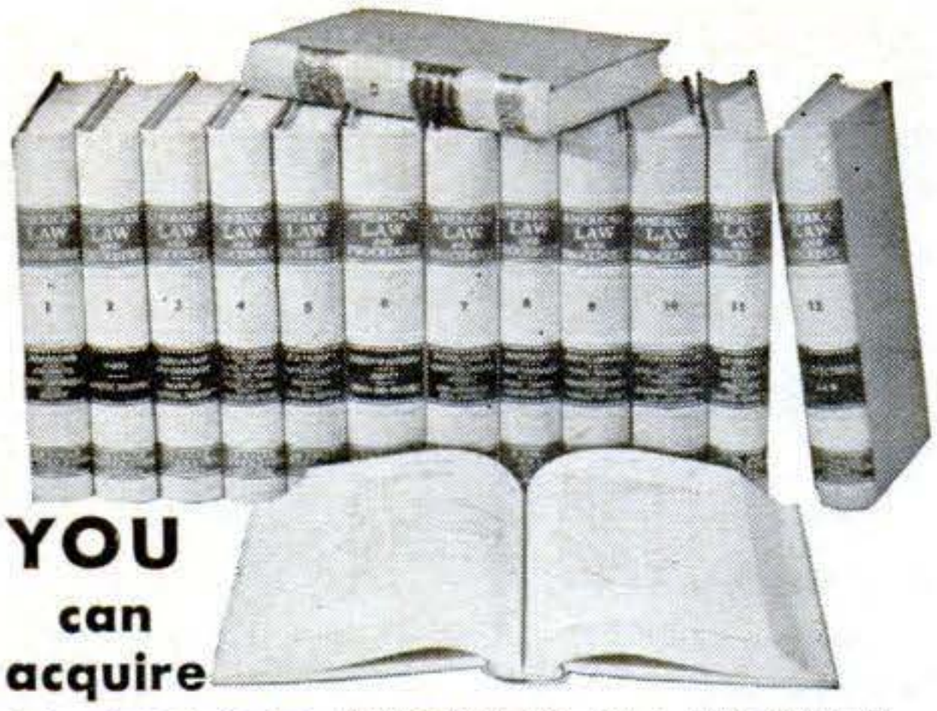

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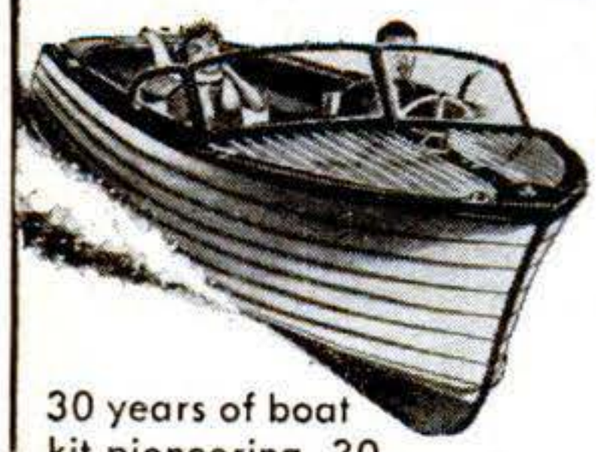

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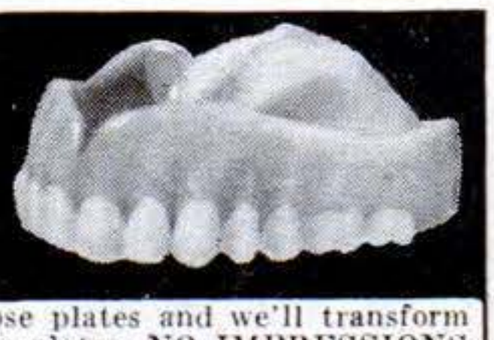

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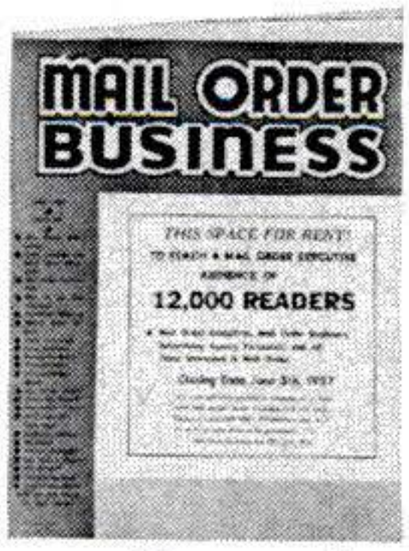

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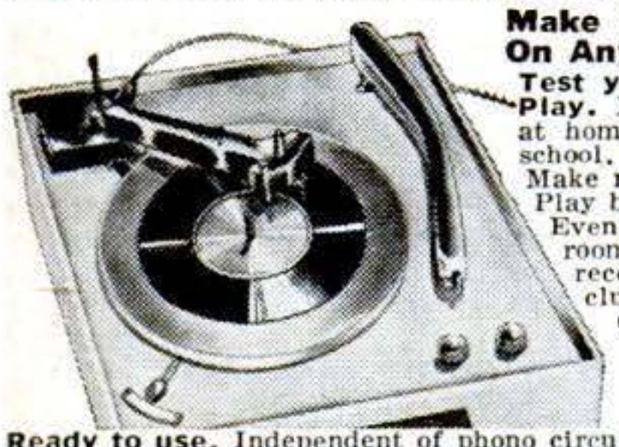

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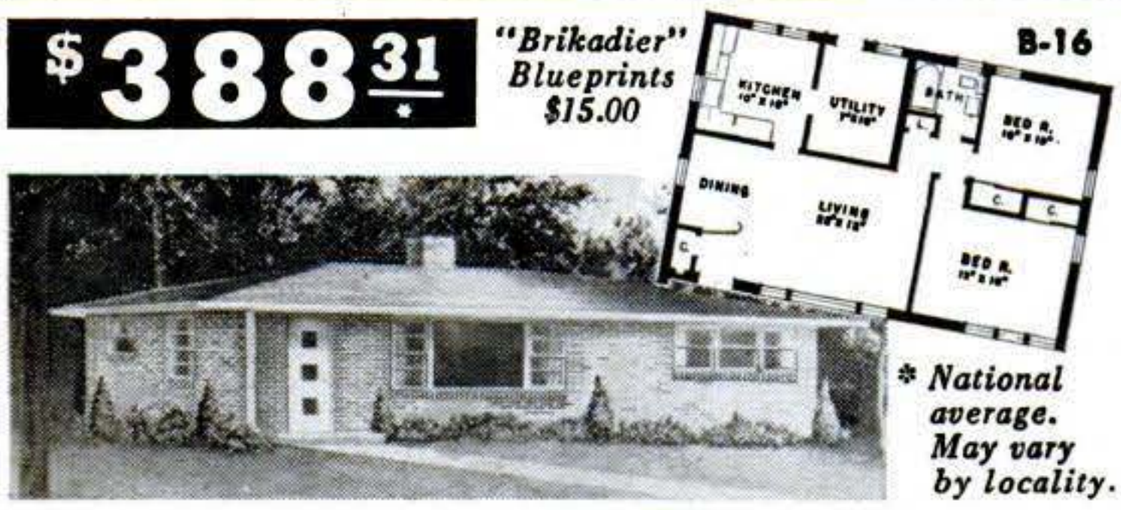

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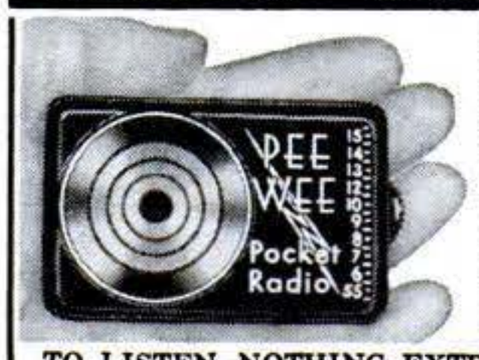

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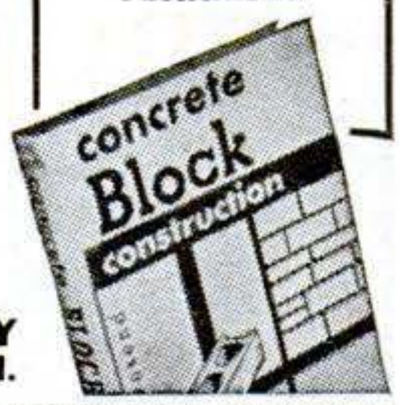

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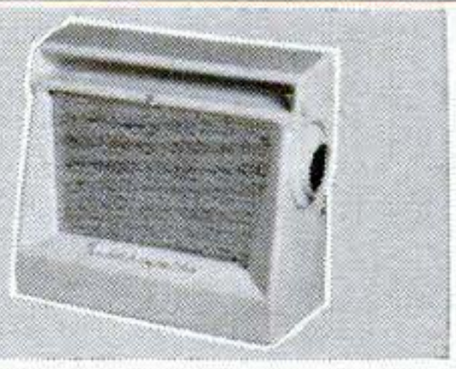

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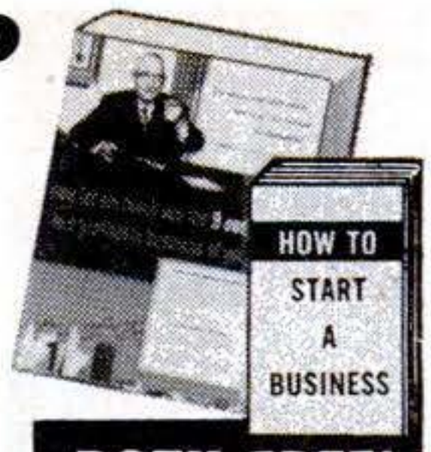

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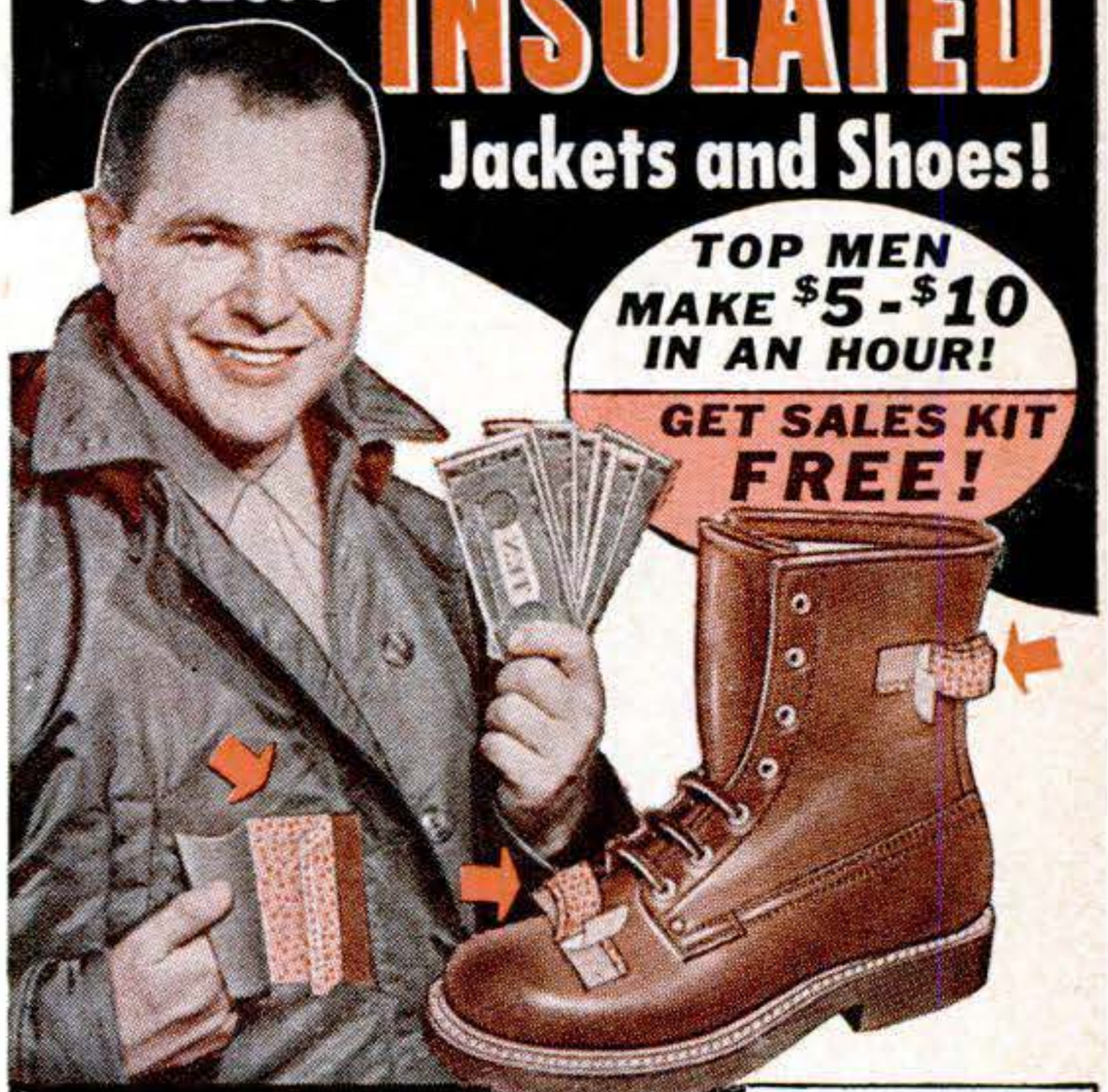

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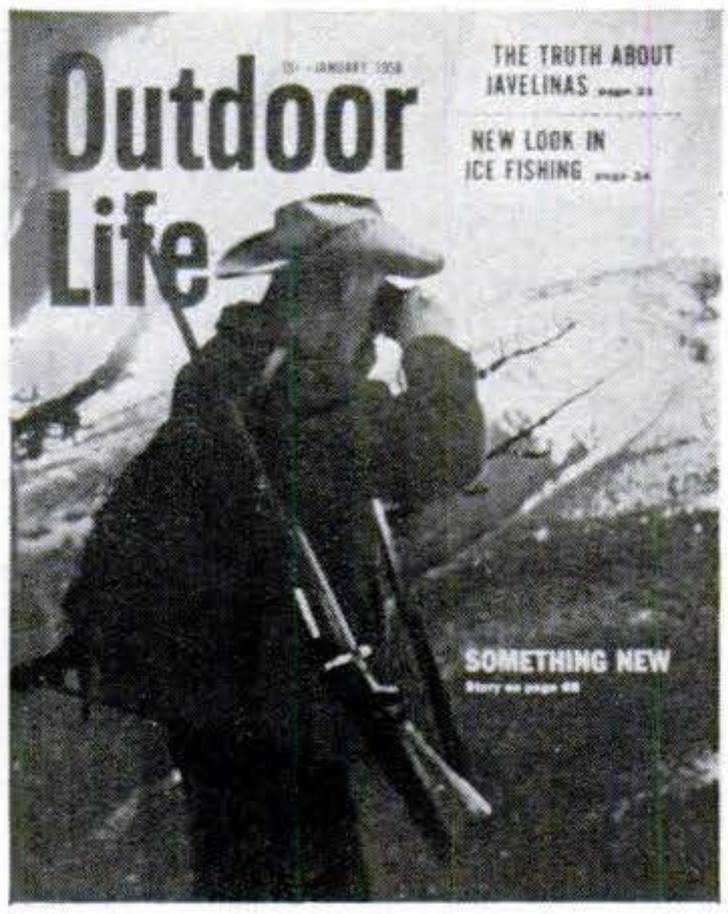

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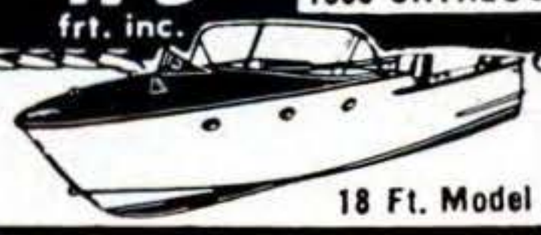

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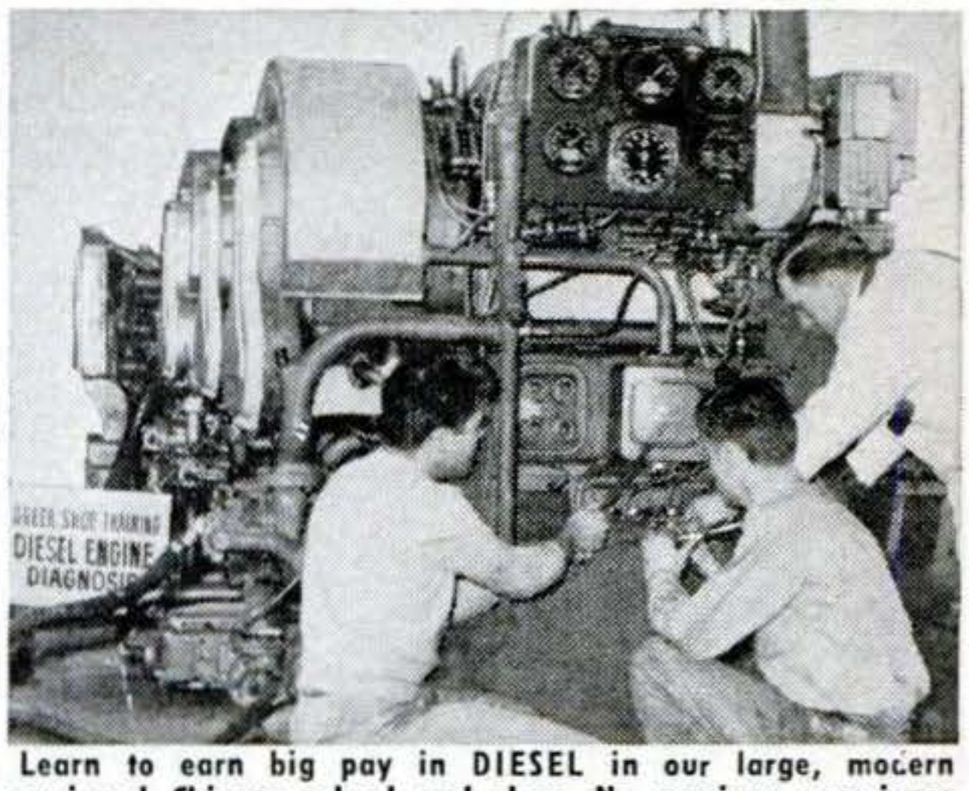

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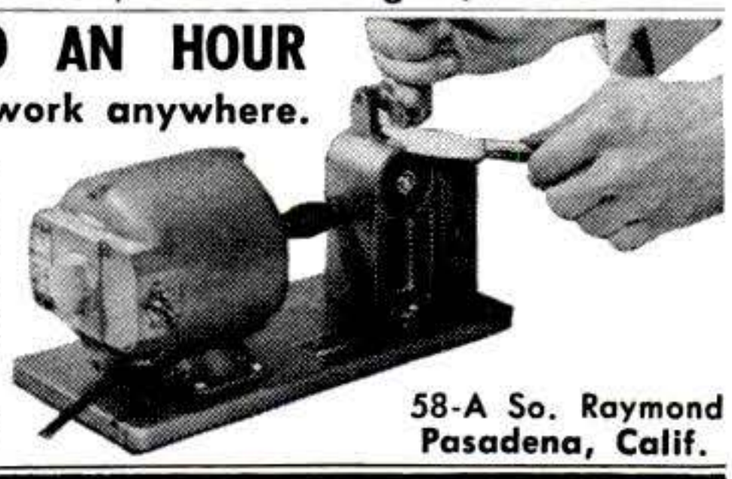

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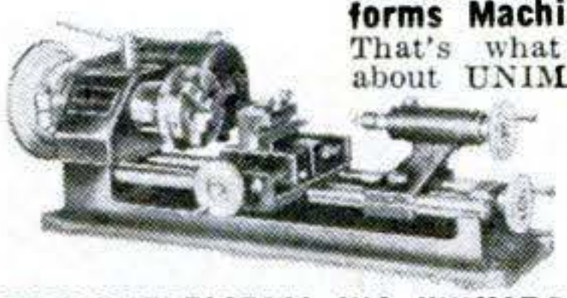

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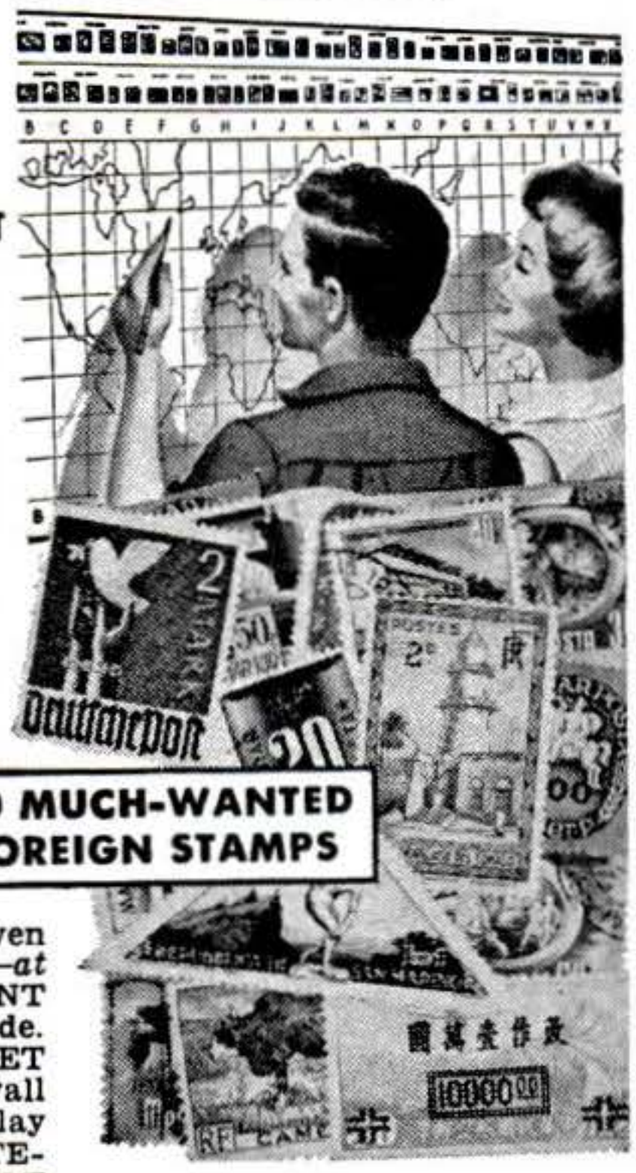

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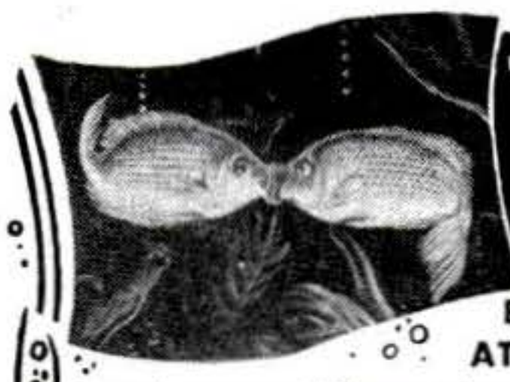

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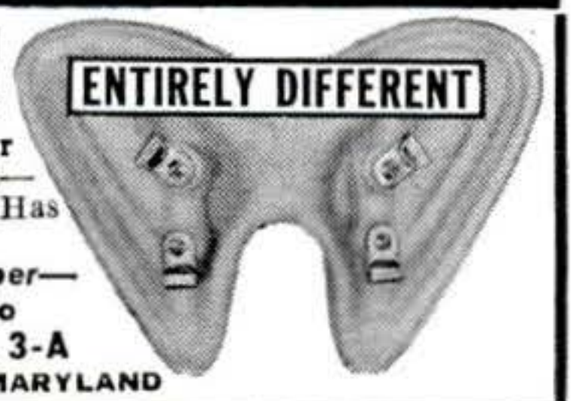

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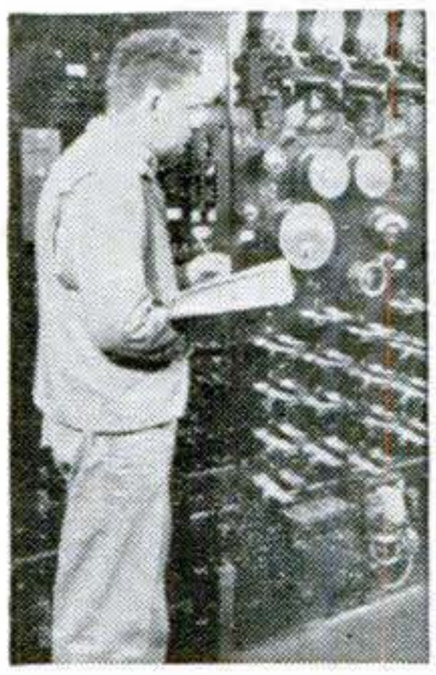

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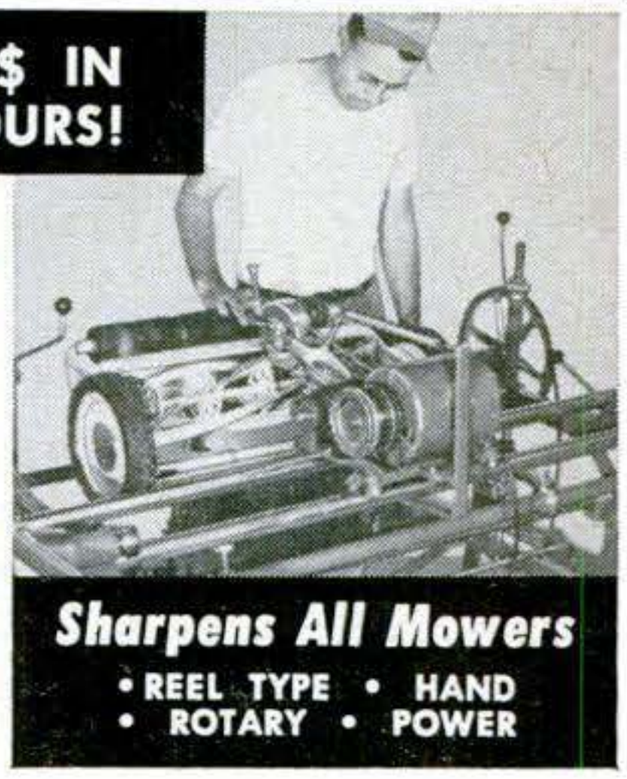

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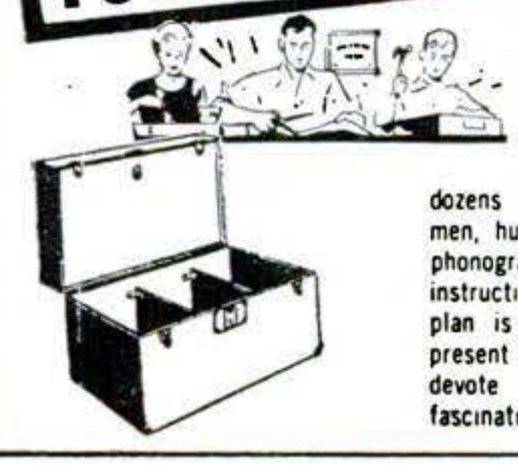

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February POPULAR SCIENCE takes you on a fascinating trip – away off the beaten tourist path – through post-Sputnik Russia. You'll be the guest of Senior Editor Harry Walton, as he brings you the exclusive, exciting story of his 3,500-mile run through Russia in an American station wagon. You'll get firsthand factual reports on Russian cars, traffic, drivers, repairmen, roads. This 15-page feature will include many never-before-seen pictures, 15 in full color. Don't miss it in February POPULAR SCIENCE.

ALSO IN FEBRUARY POPULAR SCIENCE

What Science Is Learning About Headaches – Are you more likely to get headaches when you're young or old? Single or married? College-educated or not? Get the surprising answers in February POPULAR SCIENCE. You'll find, too, valuable data on the two basic types of headache; news of a drug that may help countless headache sufferers; sound advice from a famous psychiatrist on how to prevent migraine headaches.

How to Get the Best Buy in Car Batteries – Here's the lowdown on what kind of battery you should get for your climate and the kind of driving you do. Learn the answers to: Should I get a stronger battery? Why is the number of plates, alone, unimportant? How can I make sure that my battery really needs replacing? And many more questions, all answered in February POPULAR SCIENCE.

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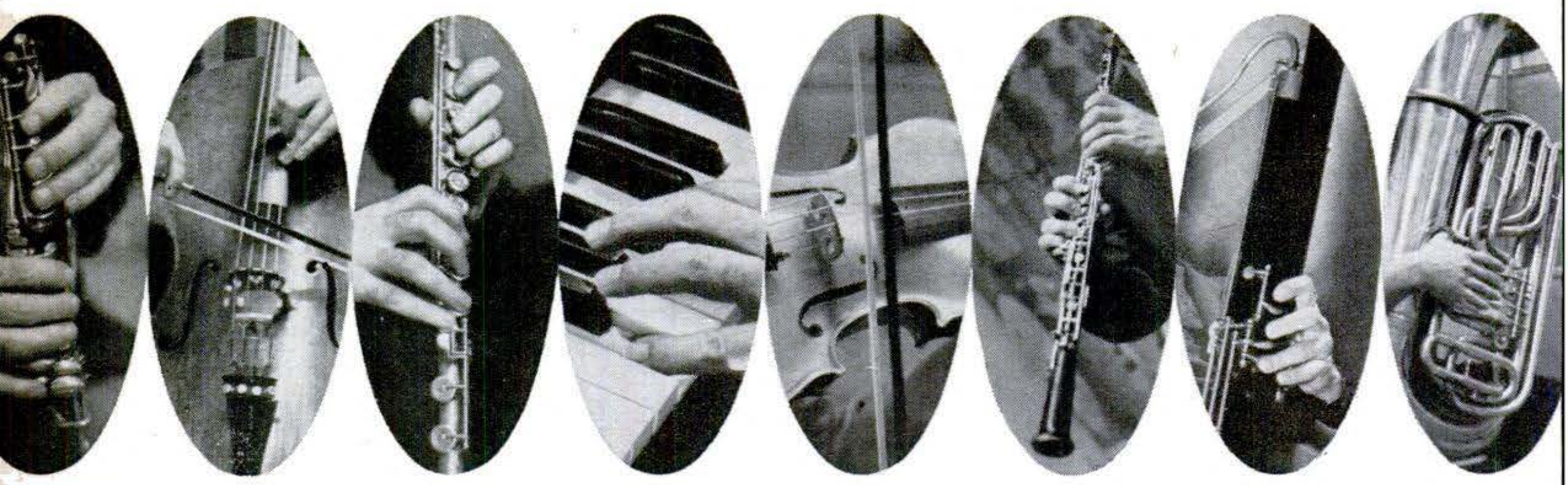

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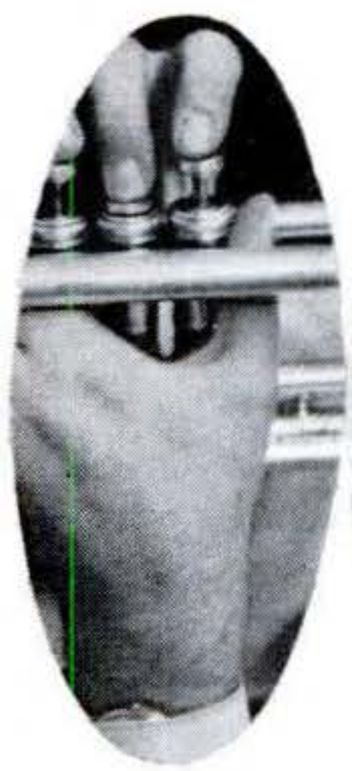

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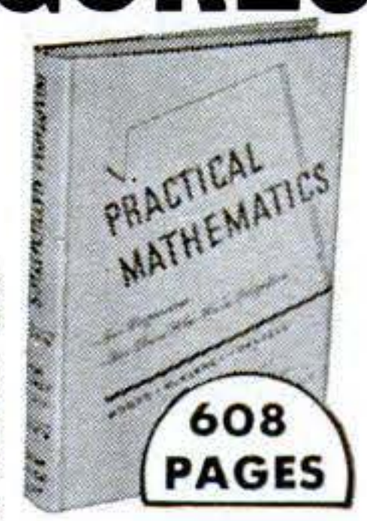

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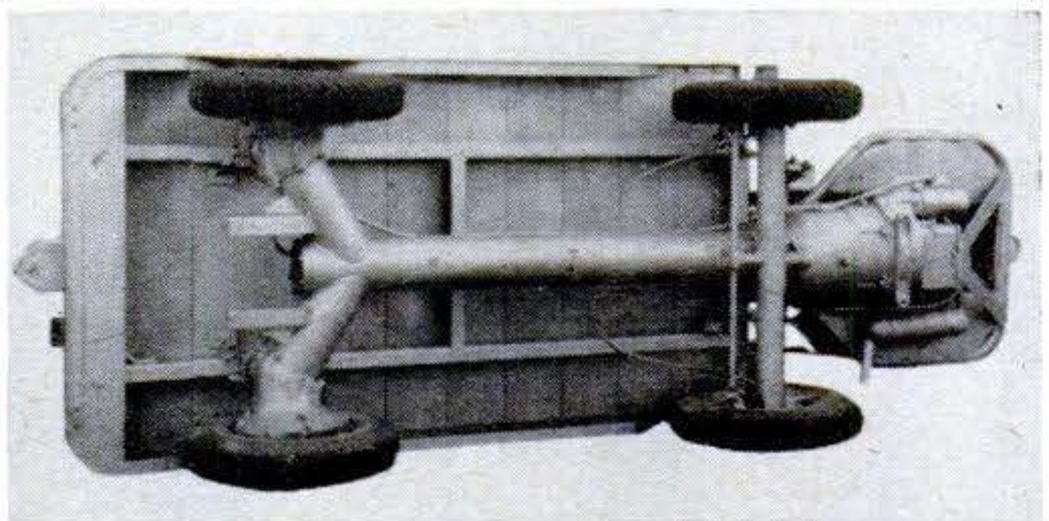

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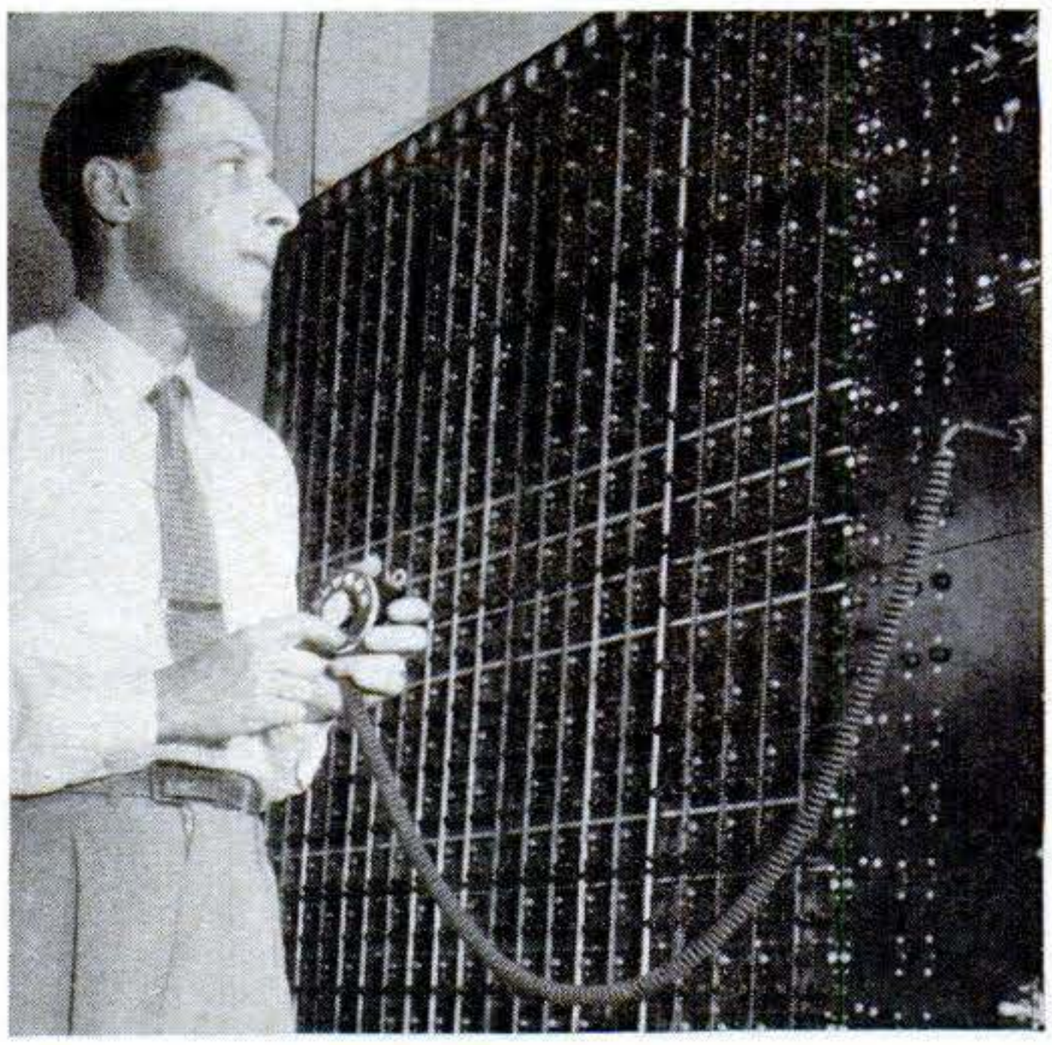
AN INFINITELY variable hydraulic transmission on this German truck is operated by an axial-piston pump run by a six-hp. diesel. Oil is piped in the tube to similar pumps driving the rear wheels.



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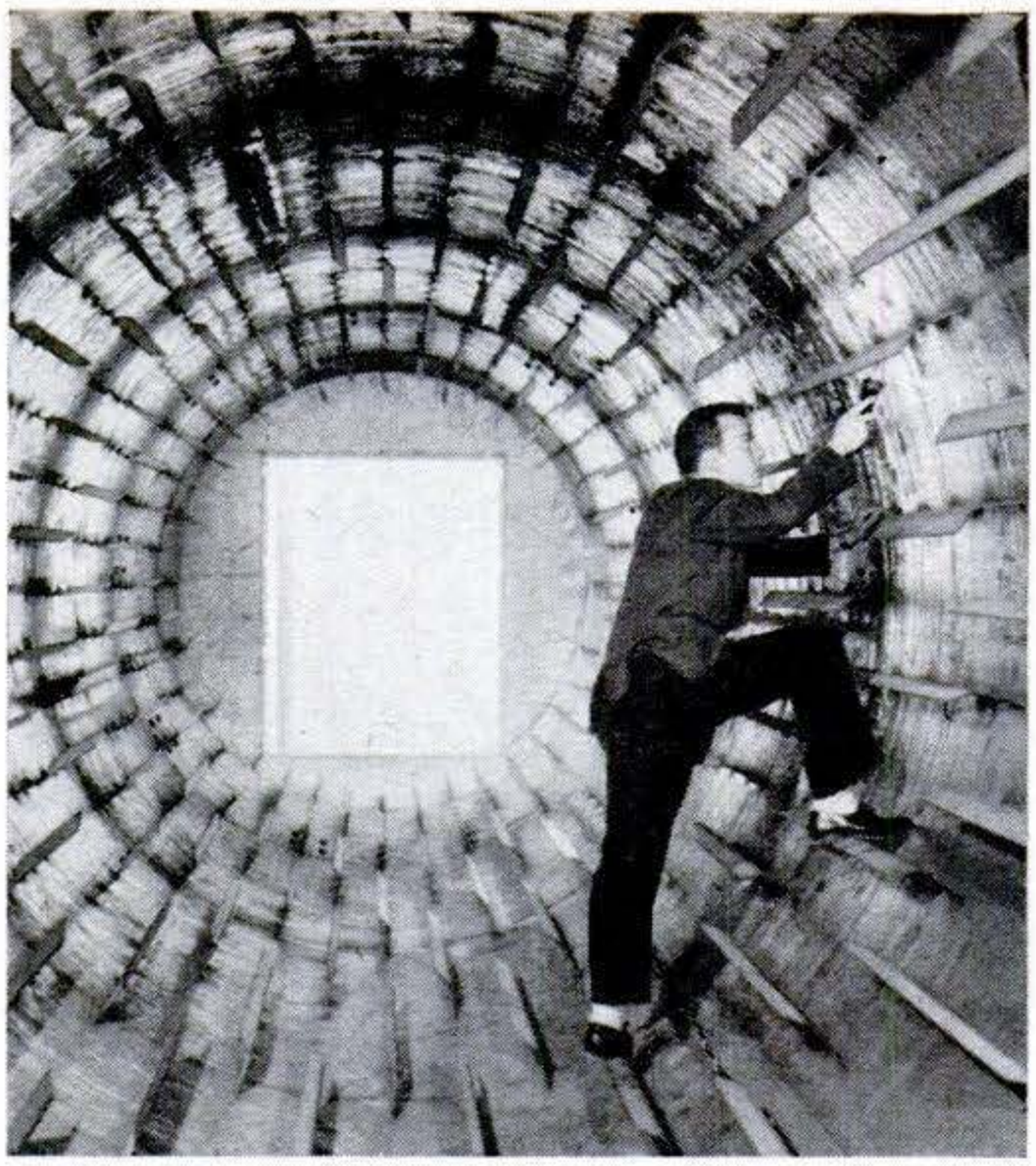

Giant roller cools hot meal

THIS roller in the new Cargill soybean plant at Memphis, Tenn., cools 200,000 tons of toasted meal a year, tossing it into an air stream from inner fins. The plant handles 8,500,000 bushels of beans, also extracts 12,500,000 gallons of oil.

Elevator rides outside tower

A TRIANGULAR elevator speeds patrons to a tower restaurant at the fairgrounds in Hanover, Germany. It makes the 225-foot trip in 15 seconds. The tower is built of two reinforced-concrete tubes.

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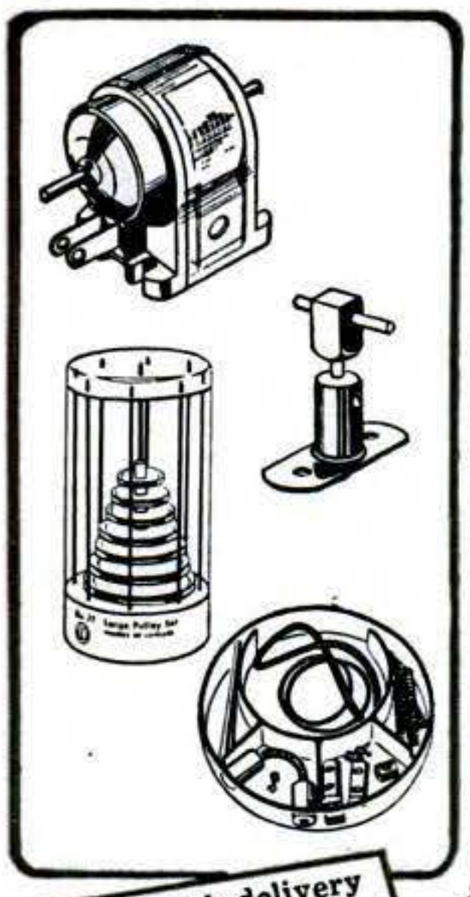
"TINY ATOM" ELECTRIC MOTORS for HOBBY—RESEARCH—INDUSTRY



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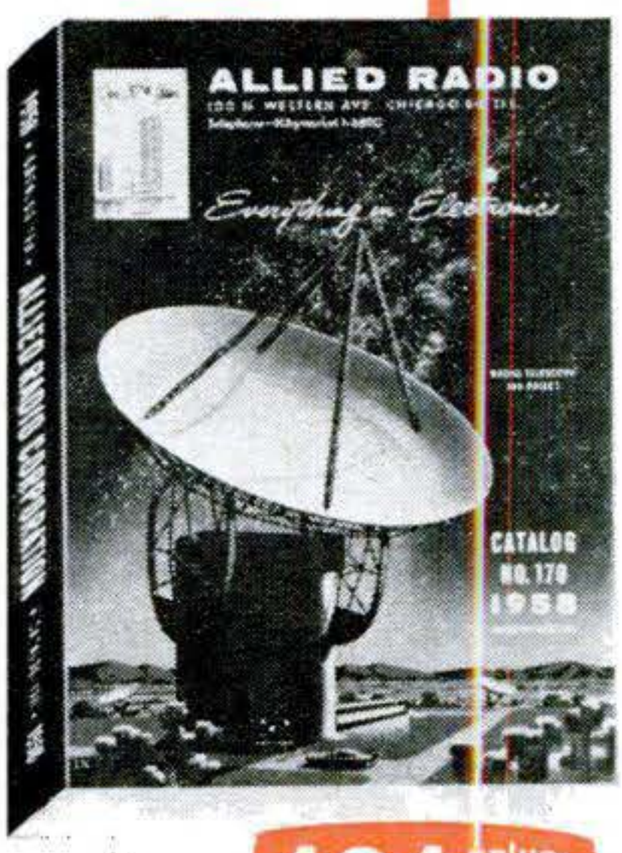

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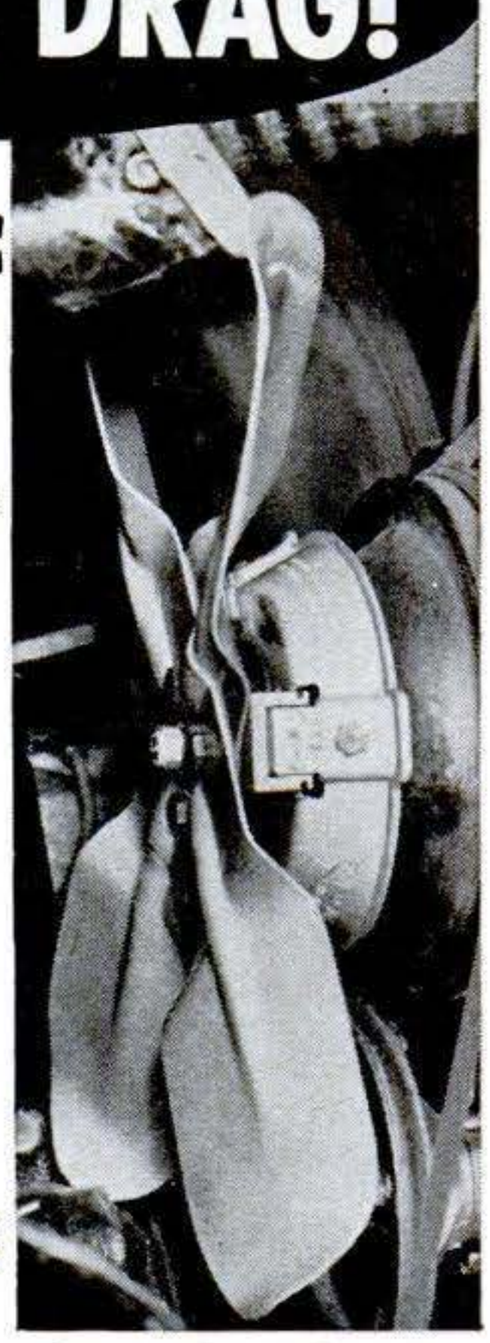

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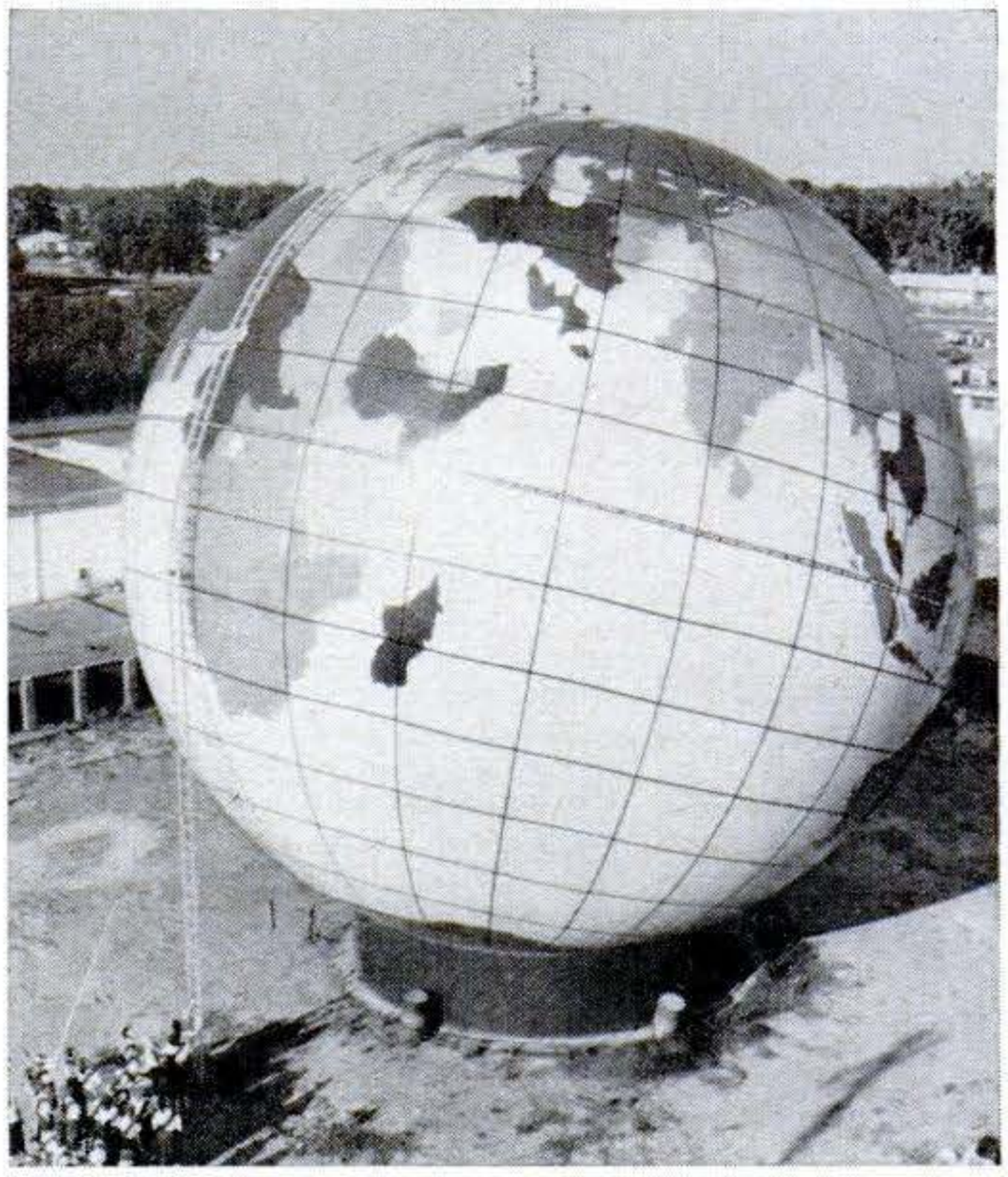

World mapped on big gas tank

SIXTY feet across and 189 around, this steel globe stores gas for Savannah, Ga., utility users. Said to be the world's largest, the tank holds 600,000 cubic feet. The map on it is just for decoration.

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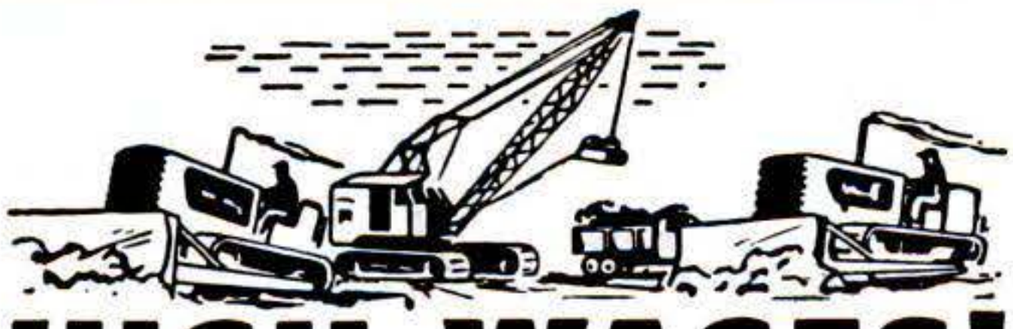

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All over the United States, more and more men and women report large profits from introducing the new Presto Fire Extinguisher. And no wonder! 11,000 people died in fires last year! Over half were women and children! Civilian defense authorities have said that in the event of atomic attack regular fire-fighting forces will be fighting large fires and that the people must be equipped to take care instantly of the little fire that might so easily become a big one. So an eager public has been waiting for a handy new kind of fire extinguisher—one *without the drawbacks* of large, bulky, expensive models. Now it's here.

- **Ends fire fast as 2 seconds**
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"I have made an excellent living with the Presto Fire Extinguisher, having made over $1,000 a month. Presto is a 'natural'."

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You can make good money in this way too! Just start introducing this new kind of fire extinguisher to civil defense workers, owners of homes, farms, cars, boats, filling stations, buses, trucks, factories, offices, in your locality and to stores for re-sale.

The Presto is so light—so small—so handy—even a child can put out a blaze with it. So inexpensive ($4.95) anyone can afford it. Yet its contents (a new wonder chemical developed during the war) have been rated 1.5 to 6 times as effective as other extinguishing agents on an equal weight basis!

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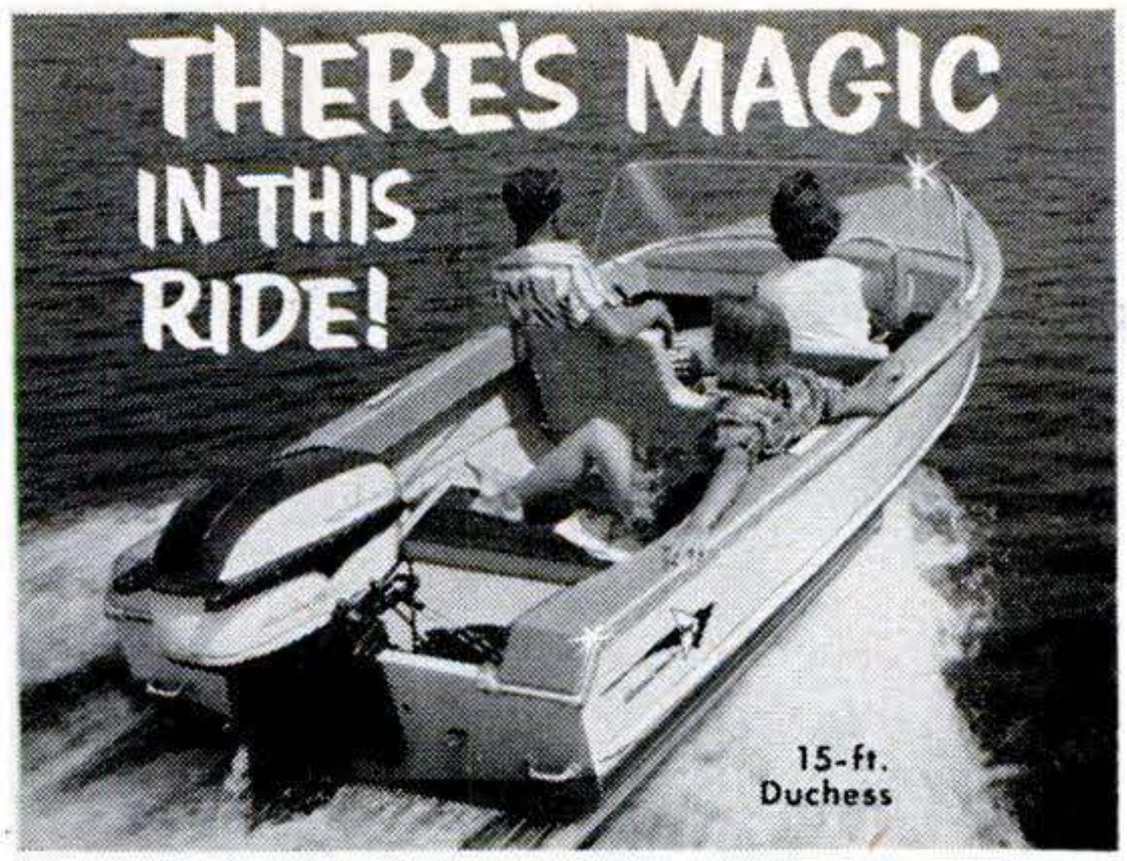

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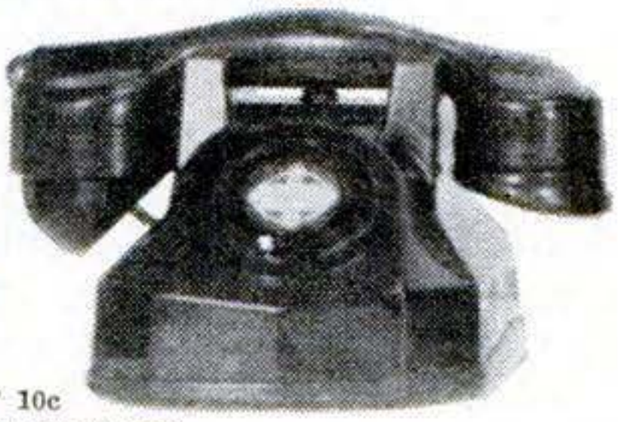

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Vitamin B-1	5 Mg.	Niacinamide	20 Mg.	Potassium	5 Mg.
Vitamin B-2	2 Mg.	Vitamin K	0.2 Mg.	Zinc	1 Mg.
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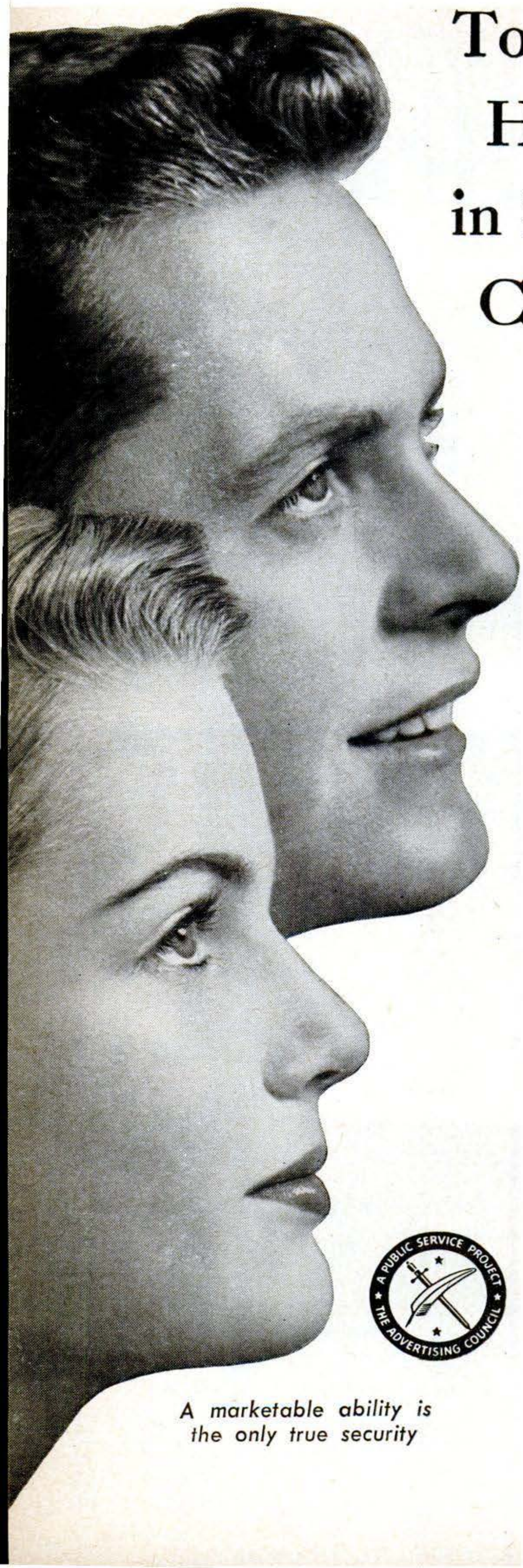

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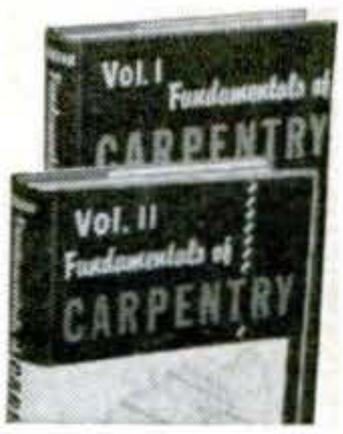

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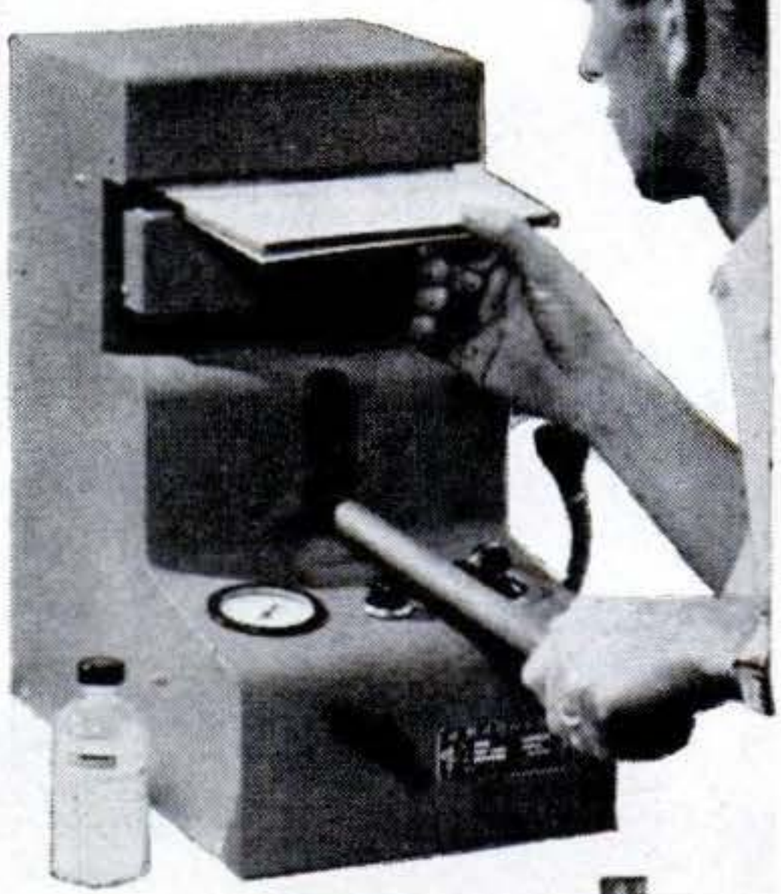

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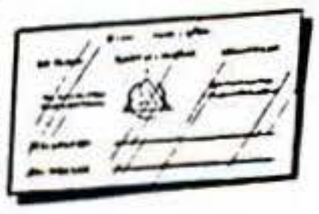

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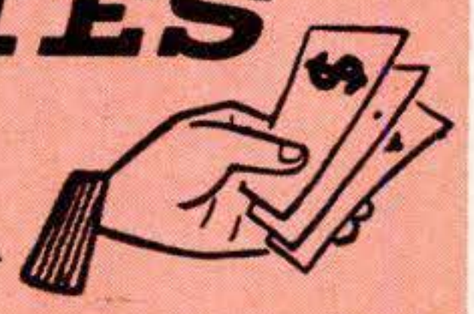

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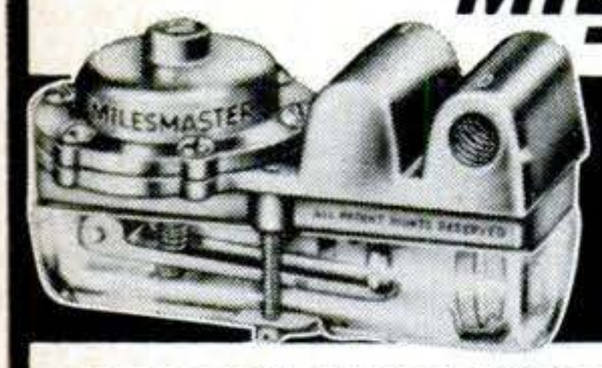

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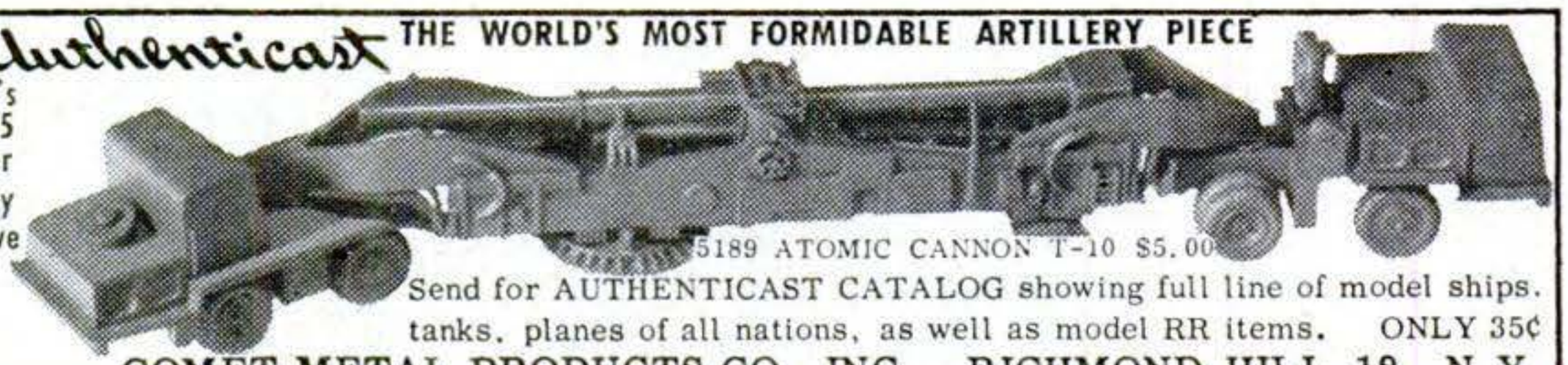

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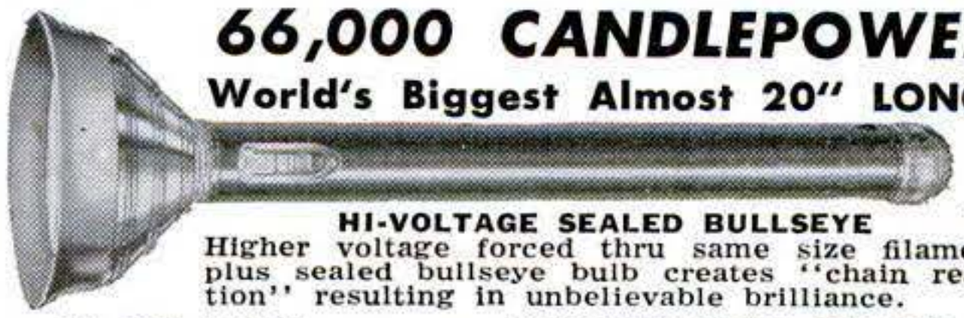

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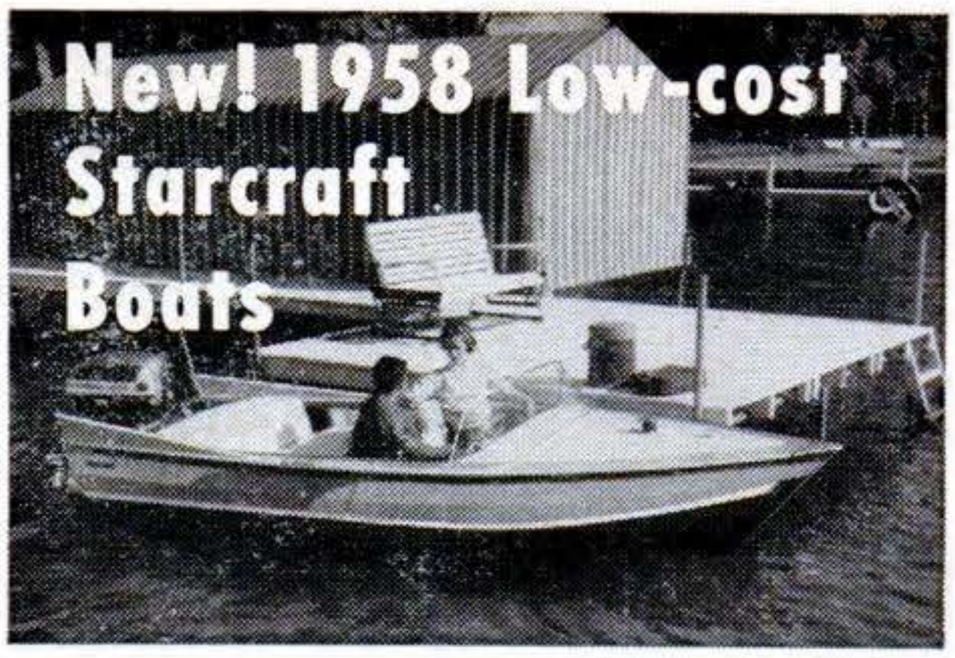

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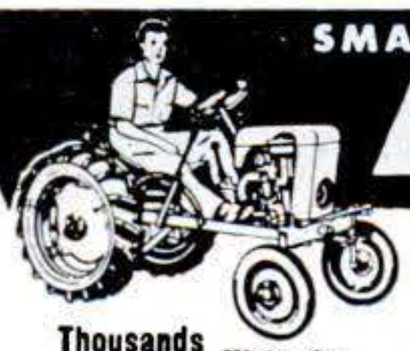

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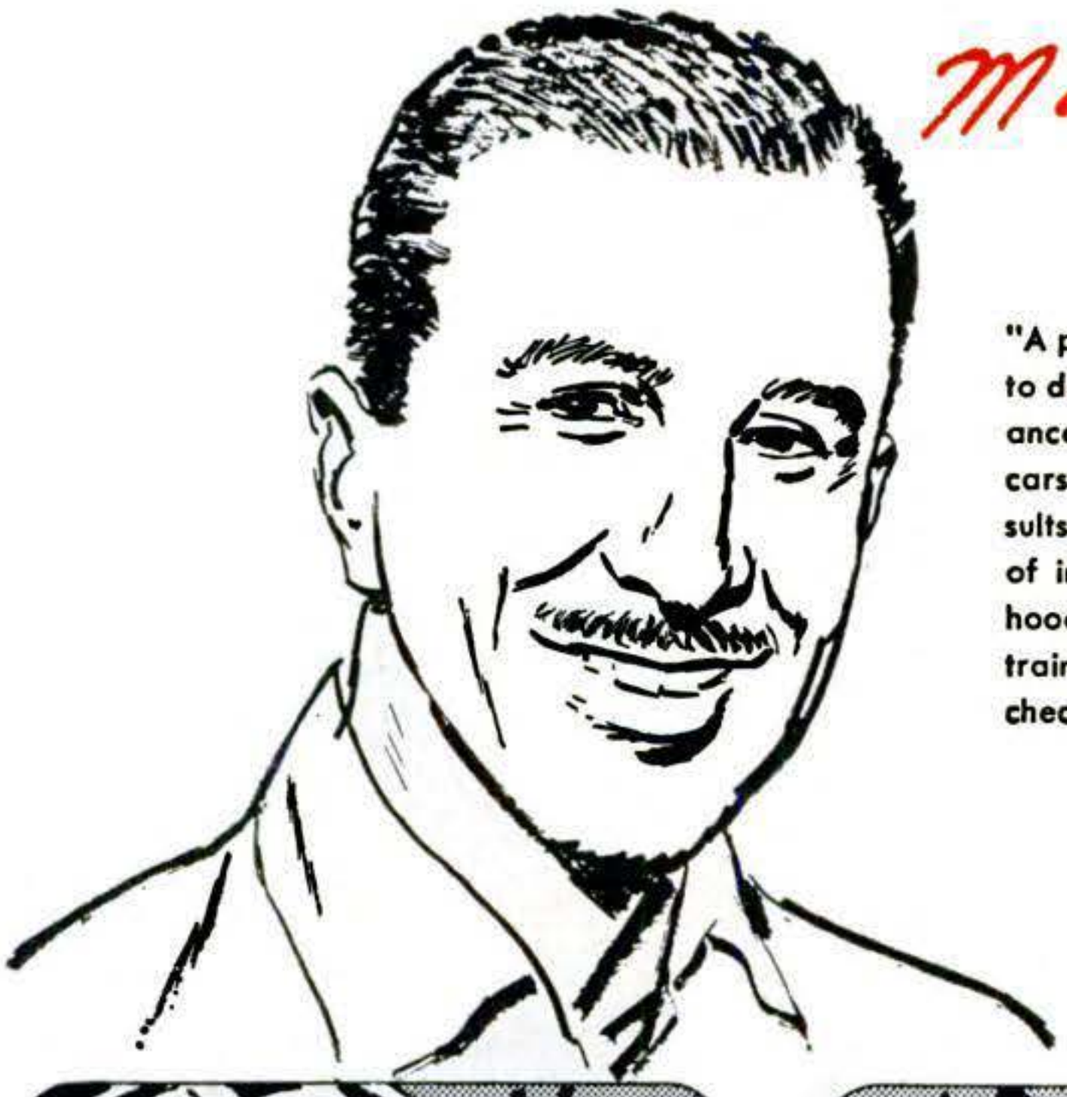
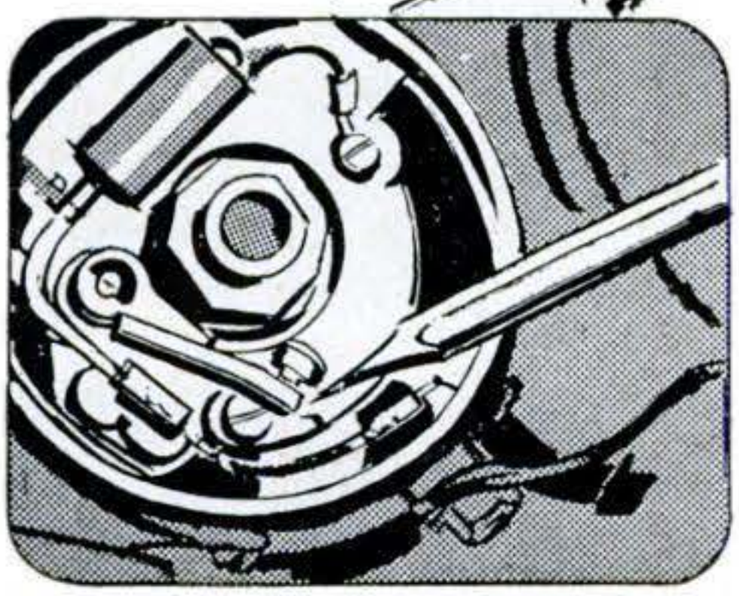
"There's more than one way to improve your gas mileage"



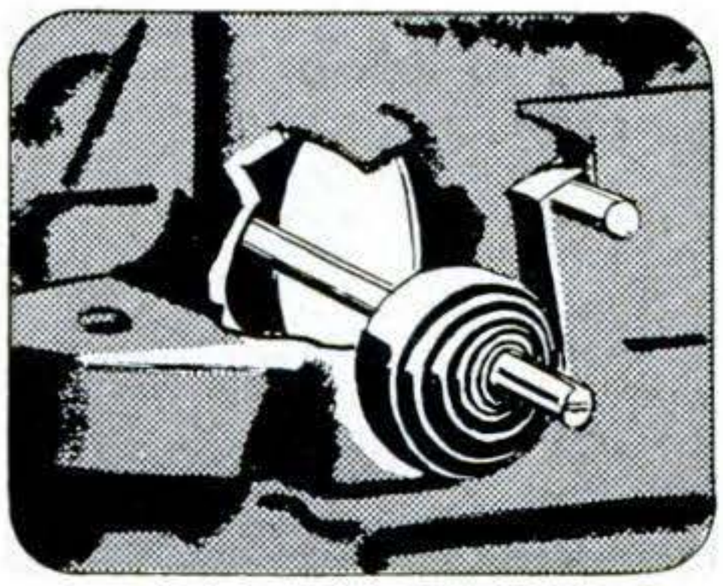
Mauri Rose —experimental test driver and automotive engineer.

"A professional driver has a lot to do with getting top performance and economy from new cars he tests. But, the best results also depend on a number of intricate systems under the hood. That's why he relies on trained mechanics for needed checks and adjustments."

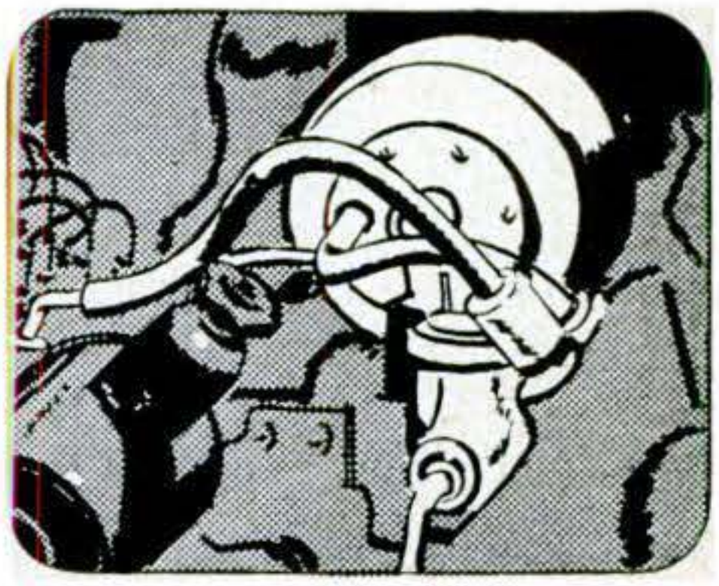
"Worn spark plugs could be a source of power and fuel loss. Electrodes must be clean, properly gapped and free from corrosion. New plugs at least every 10,000 miles is best."



"A pro always makes sure distributor points are clean and set at the proper distance for best performance. Arcing or cracks in the cap may develop to further decrease gas mileage."



"A trained mechanic checks the manifold heat control valve for possible trouble. A valve that's stuck open delays proper vaporization, a closed valve creates a loss of power."



"The vacuum system must be examined and connections tightened. Air filters should be cleaned. Clogged filters or air leaks upset mixture ratio and cause rough idle and fuel loss."

"Your carburetor should also receive a thorough check for any signs of needed adjustment, repair or cleaning. Proper care assures precision operation and maximum fuel economy."

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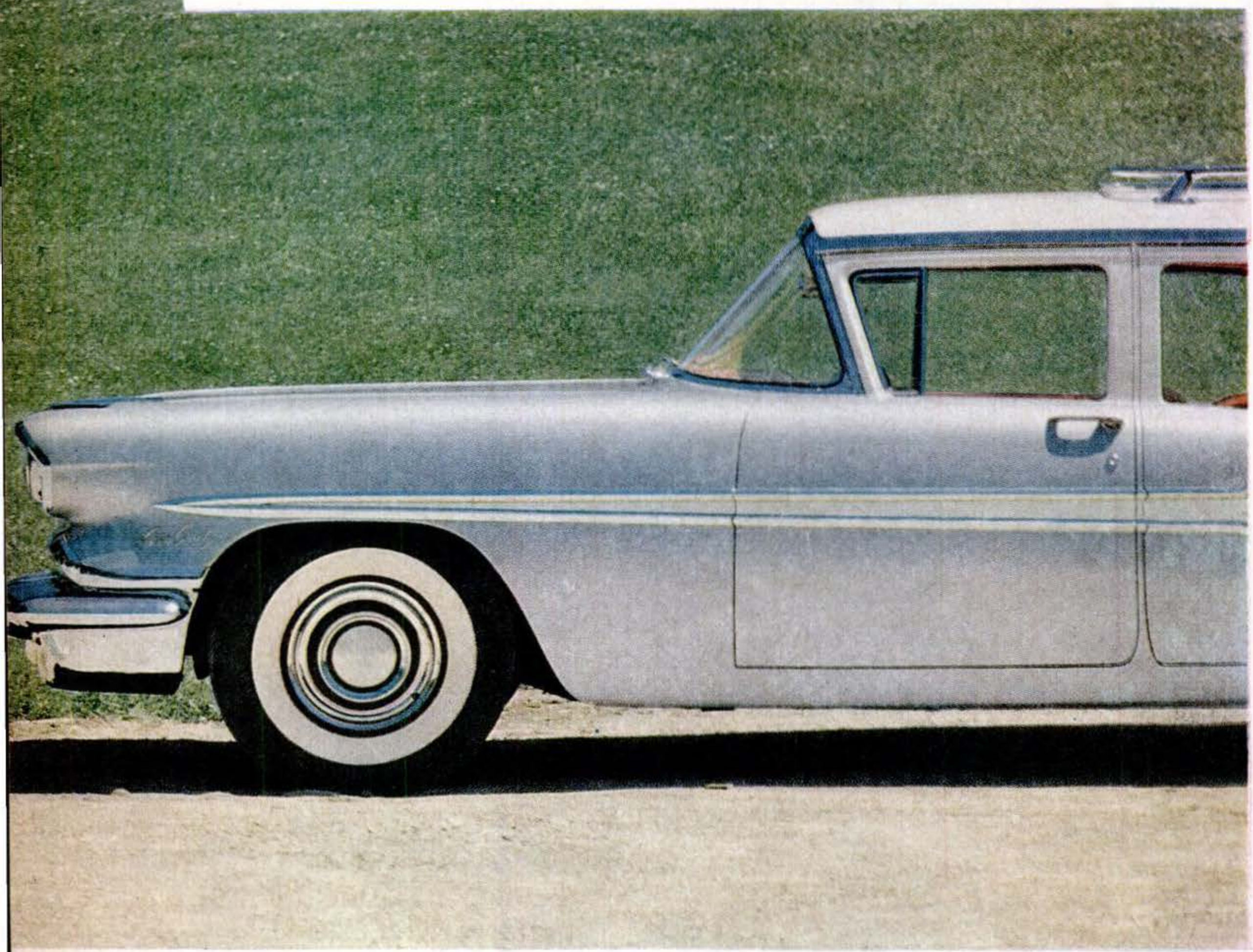
'58 Wagons:
The Word Is Comfort

By David R. Lindsay

HAVING made a lady of the once utilitarian station wagon, Detroit is now planning to boost her into high-sales society. For this, she's getting a more sedanlike wardrobe than ever—transoms and tailgates the housewife laden with groceries can open with one finger; rear seats a non-wrestler can fold; carpeted cargo floors a barefoot camper will feel warm on. Here's a roundup of the '58s. Detroit hopes to sell a record million of them this year.



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Pontiac

wagon this year has been redesigned where, for the real wagon man, it counts—in the cargo space. Among the changes: A single pushbutton opens transom and tailgate; torsion bar automatically lifts transom. Hardware has less shake and rattle when rear is open. Cargo floor has hinged section to cover back of folded seat. Back and bottom of second seat fold as a unit. Even third seat in nine-passenger model collapses into floor, with only light snap-out cushions to be removed. Rear opening is wider and higher, with the rear of the roof hinged.

Full details and dimensions of 1958 U. S. station wagons

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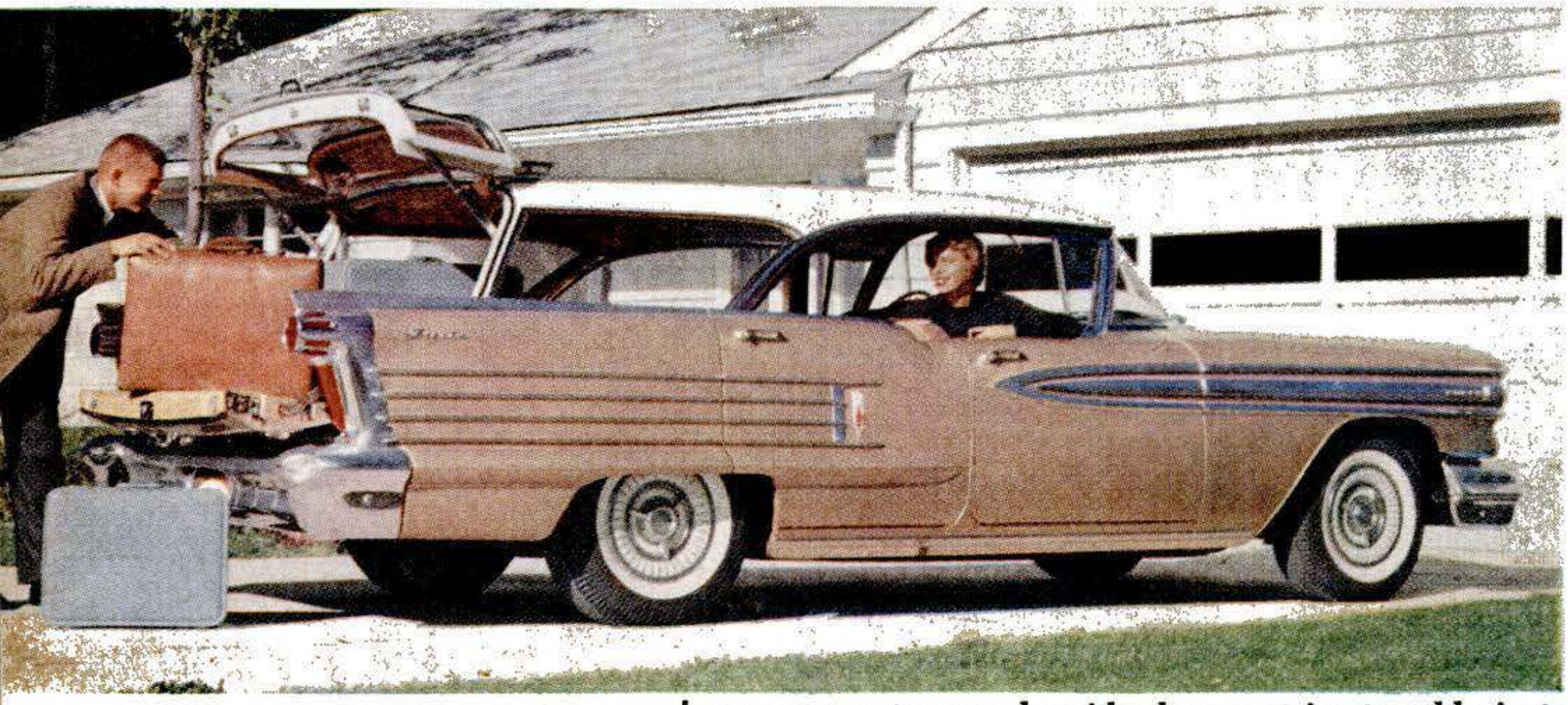
Chevrolet

shares Pontiac's cargo-space improvements. Rear seats on both wagons are designed so they won't fold on their occupants in crash stops. Rear openings have an anti-jimmy latch, one of several new approaches to the problem of protecting luggage in glassed-in cargo space where it attracts the curious and lightfingered.



Oldsmobile

has new quarter panels with chrome strips to add zip to hardtop window line. Like many '58s, it's available with air springing to keep it at same height despite cargo.

Studebaker

makes two wagons, has aimed the lower-priced Scotsman, left, at economy and utility trade. This two-door has minimum of trim, special overload rear springs. For the first time, 14-inch wheels and low-pressure tires are standard on V-8. Although the Studies are small, they have one of the highest rear openings in the automobile industry.

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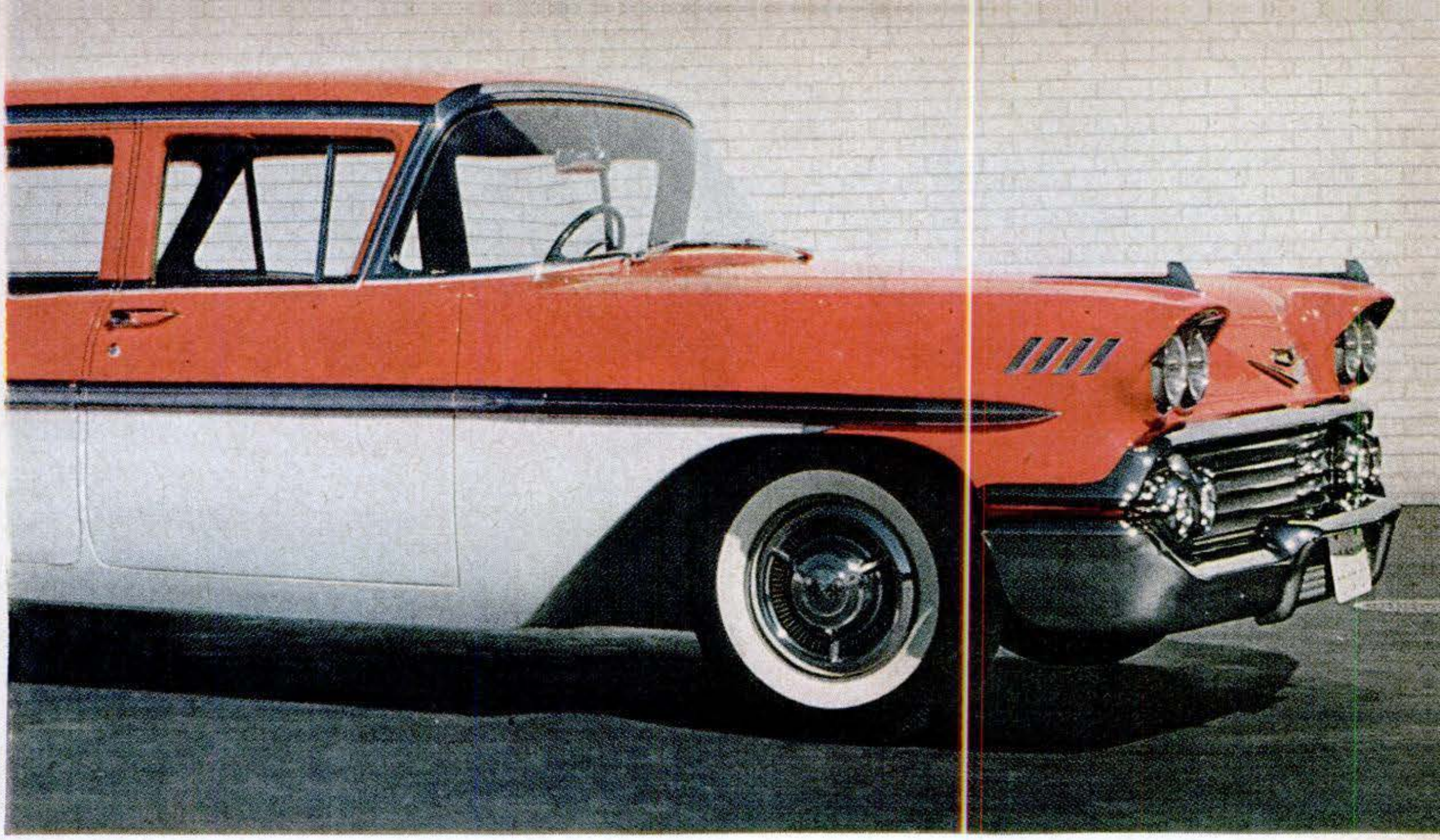

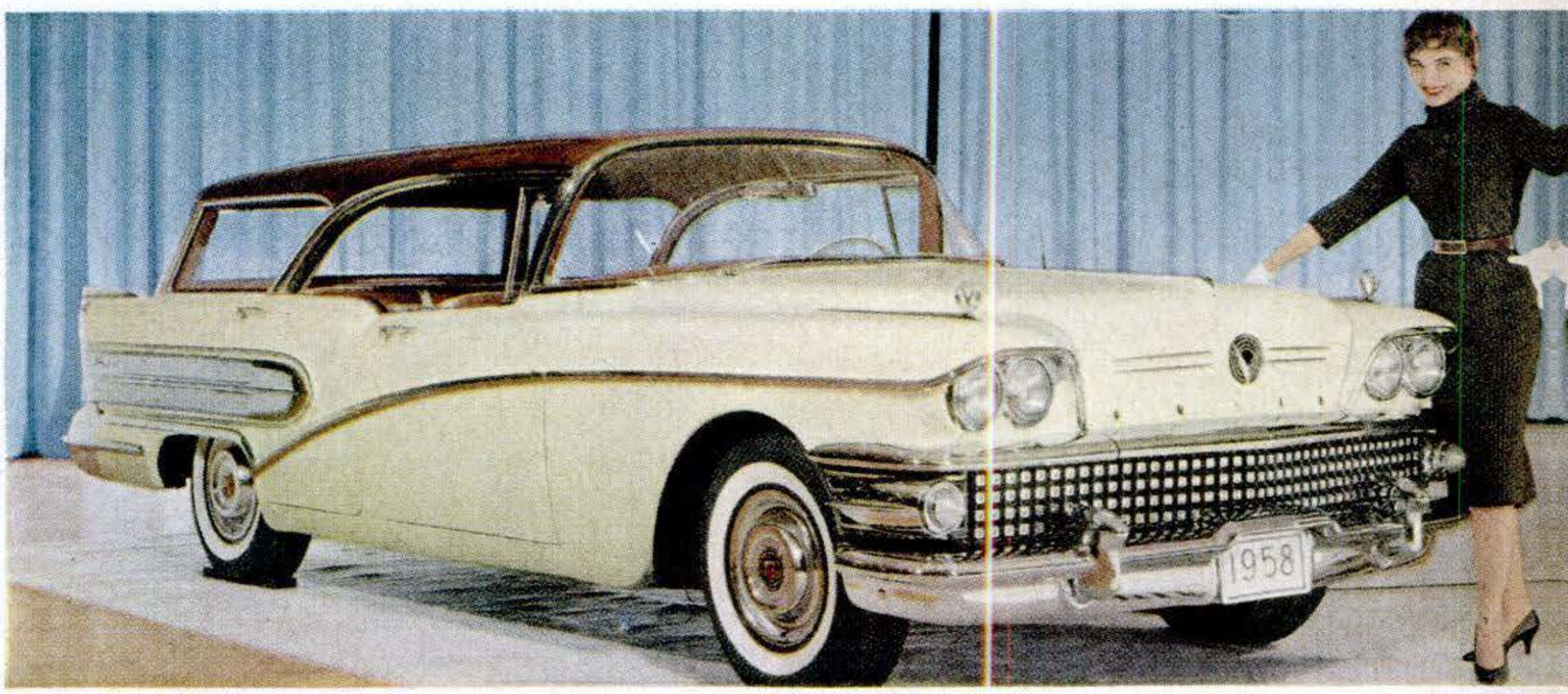

Buick makes biggest wagons in GM family. This year they're longer, lower than ever. Some models come with puncture-proof Captive-Air tires: no spare, more luggage room.

Ambassador

is one of the sedanized wagons, has wall-to-wall carpeting in cargo space of Custom models. This year, following the company's other cars, the wagon has reclining front seats. For the first time, the entire body of these cars (and the rest of the American Motors line, as well) is being dipped in a chemical rust inhibitor prior to painting.

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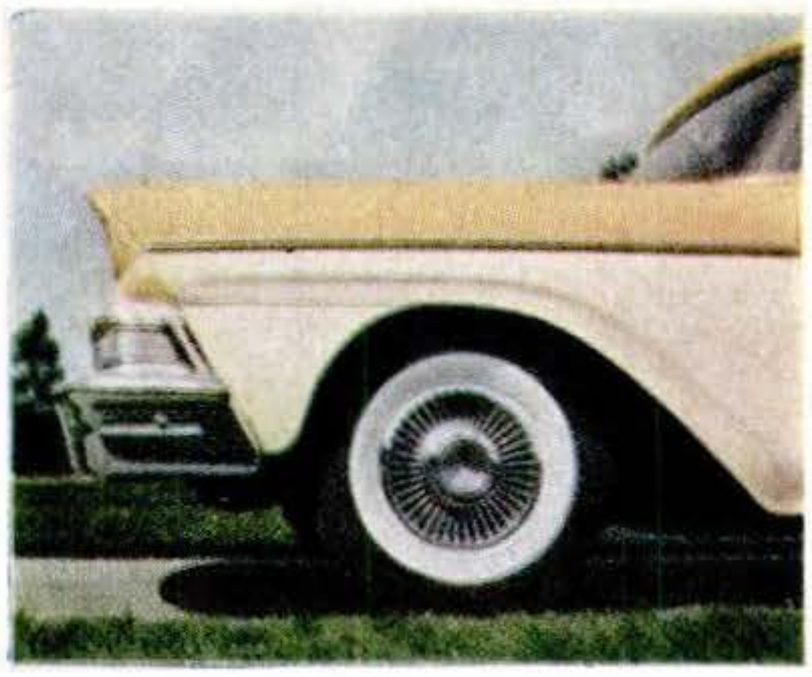


Ford

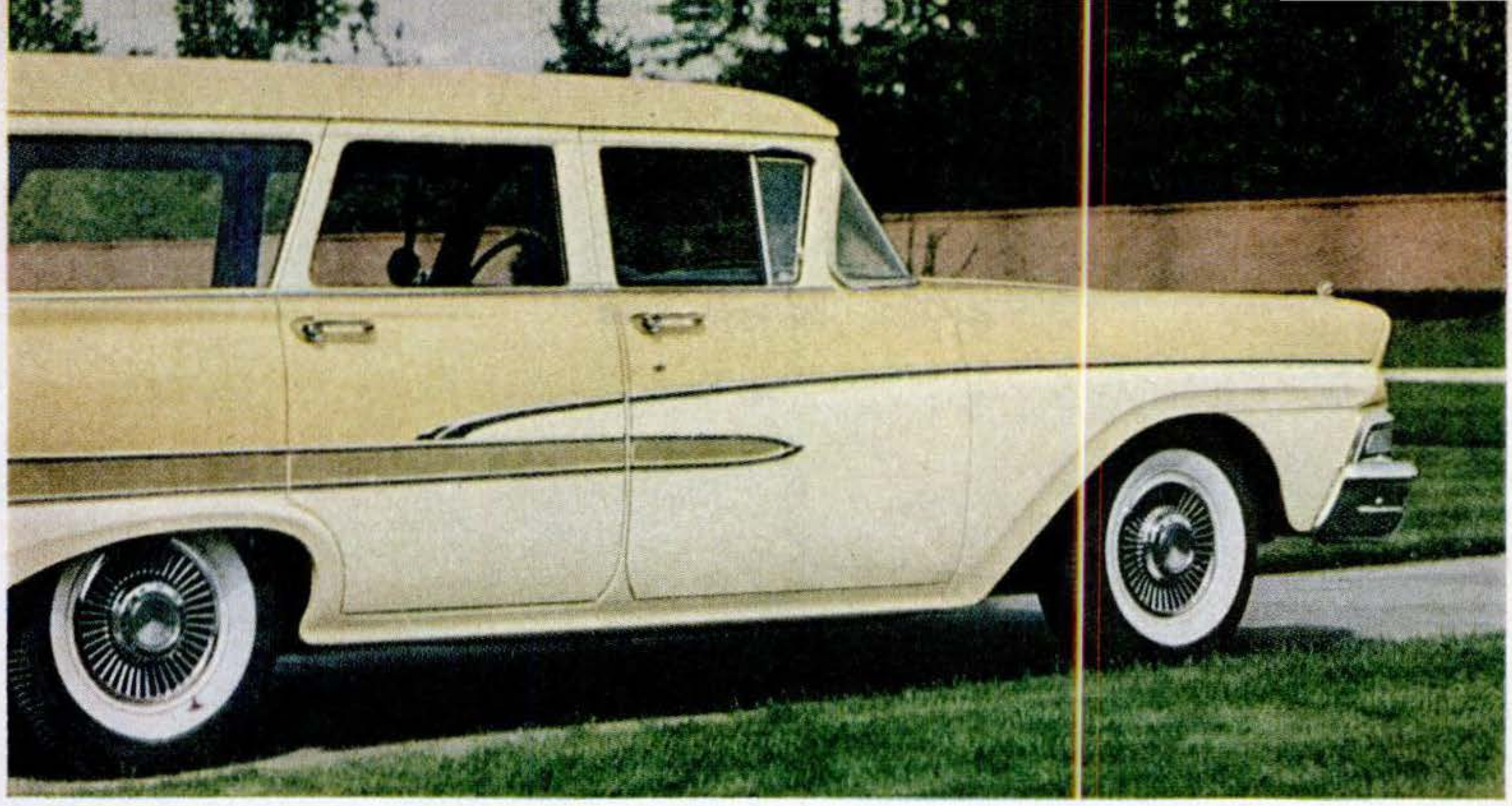
has new trim and tail lights; new spring-loaded transom that opens part way by itself and has multiple-adjustment ratchet supports. Rear opening is 14 inches wider than in '57. Already wagon sales leader, Ford added a new model for '58 to produce six different wagons.

Edsel

has leaned toward relative simplicity of Ford rear-end styling in its wagons, which also have Ford transom hardware and seat details. Wagon bodies are larger than Edsel sedans, have more head- and leg-room. They're offered with choice of economy or performance axle ratios.

Mercury

takes wagon trade seriously, has just opened a new wagon-body plant at Wayne, Mich. Tail-gates have new folding-arm supports and house electric rear windows. Styling is tricked up, with one model wrapped in simulated driftwood.



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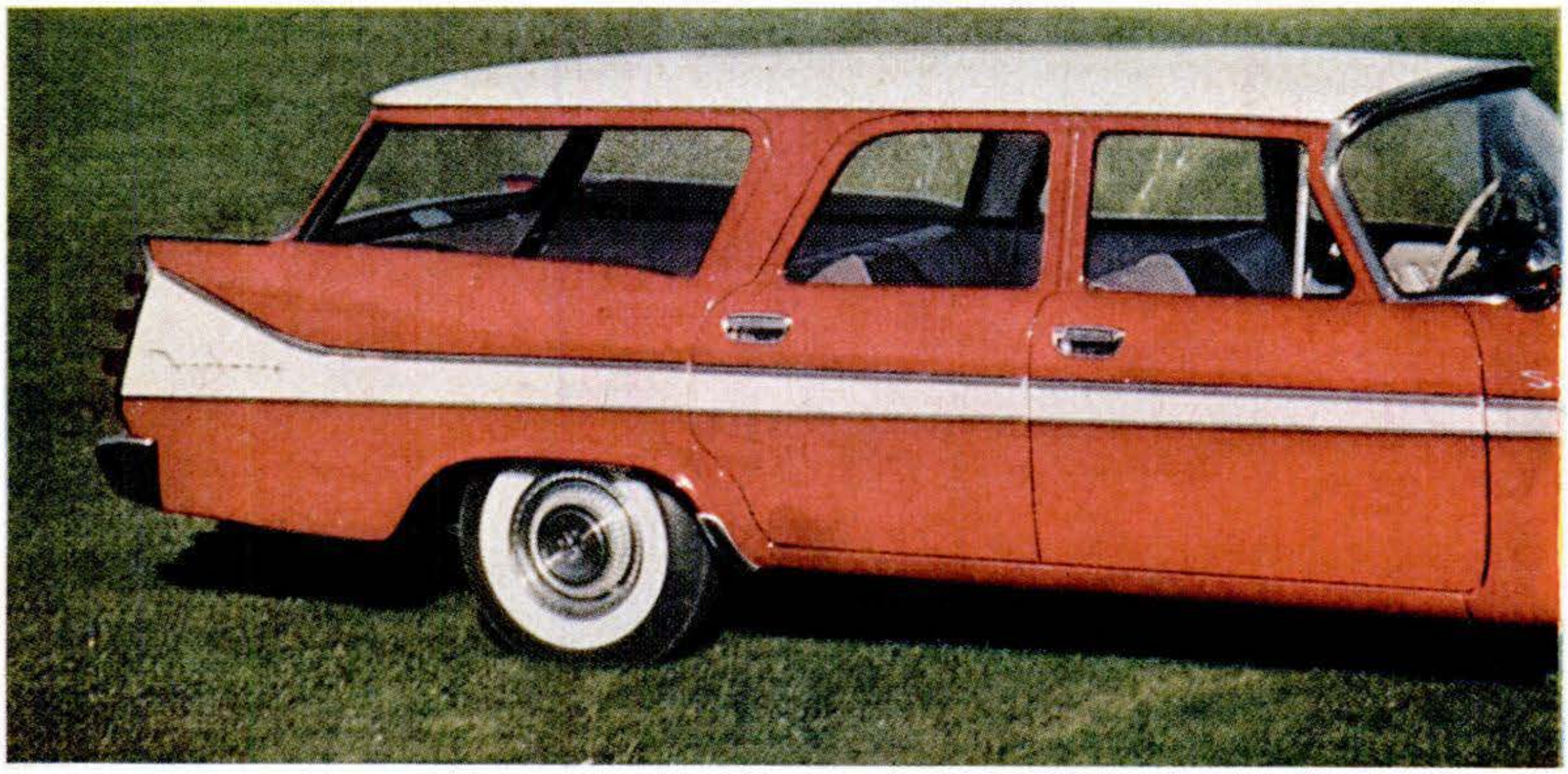
Plymouth

and the rest of the Chrysler stable share again this year the passenger and cargo enclosure design they all had last year. Dimensional differences among these makes are confined to the front of the cars. Again in '58, they are the longest wagons made. Plymouth is also heavier and has lengthened its rear springs. For the camping trade, it now has a model boasting built-in sleeping accommodations for two. For passengers who like to see where they've been, a third seat on the Plymouth faces the rear.

Dodge

wagons, three inches longer overall than the Plymouths, are available with more horsepower. Otherwise, in such things as cargo space and seating room, they and their smaller sisters are just about as similar as a couple of Hershey bars.



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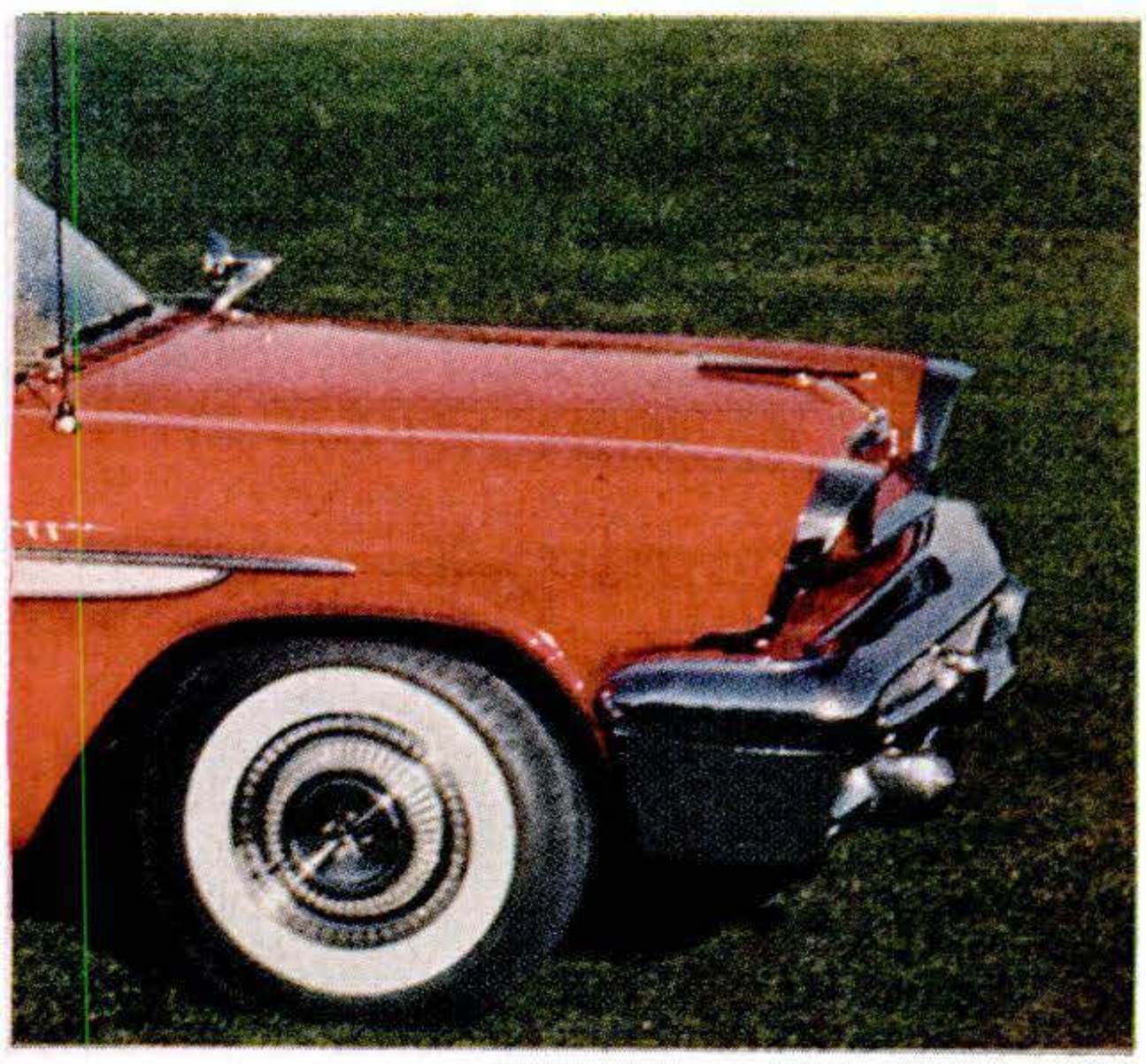
Chrysler

is offering nine-passenger models for the first time this year in its Windsor and New Yorker lines, makes no two-door wagons. All Chrysler station wagons have double-wall Captive-Air tires, eliminating spares.



De Soto

this year continues the '57 wagon styling that kicked its wagon sales up 75 percent. Body changes are confined to exterior trim, upholstery and color. De Soto wagons with double-wall tires have converted the old spare-tire well into a shallow, lockable, hidden storage space so that valuables can be kept out of sight. As before, the third seat faces the rear. Passengers here put their feet in a small well. The rear window on three-seat, nine-passenger models rolls up and down by electric power.

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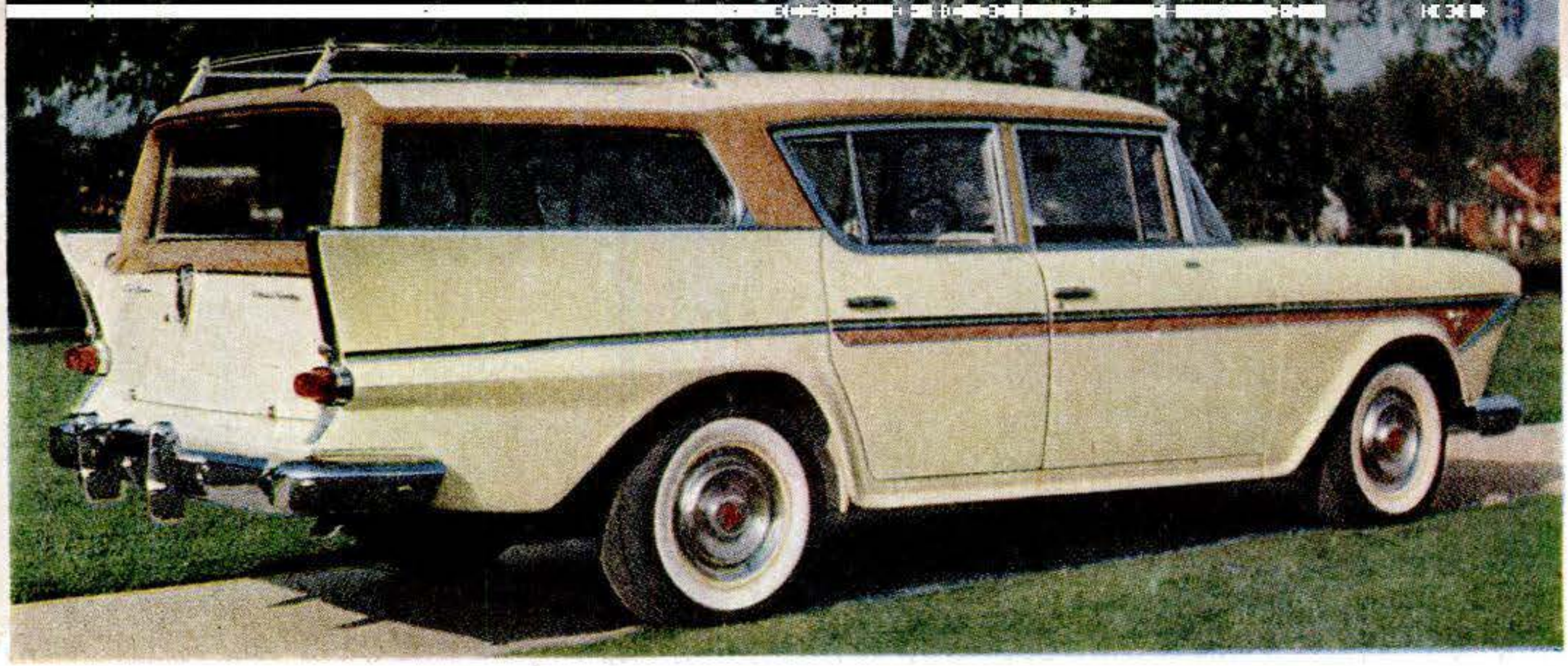
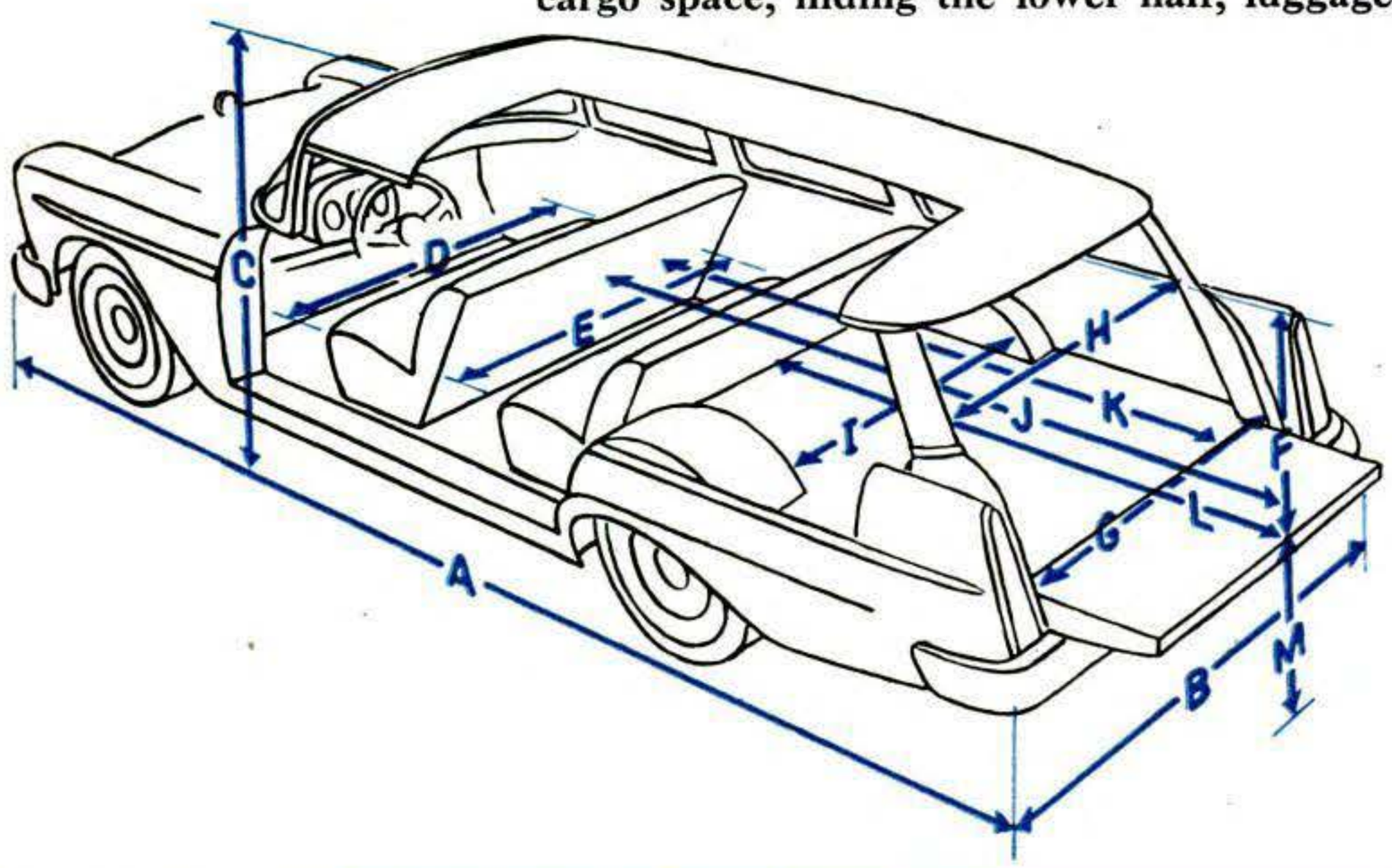


Rambler turns out proportionately more wagons than anyone—one wagon for every sedan or hardtop. The '58s have wider rear openings, one-finger tailgate latches, spring-loaded transoms, and a psychologist's challenge to the luggage thief. A window-type shade pulls horizontally across the cargo space, hiding the lower half, luggage or no.



SPECIFICATIONS of 14 wagons given in the table are for four-door, six-passenger models. Other models may differ slightly in location of second seat. Hip room is measured door-to-door above cushion. Cargo volume is the total air space, some of which is awkward to use. All figures below are inches except volume, which is given in cubic feet.

How Wagons Compare

	OVERALL DIMENSIONS			HIP ROOM		CARGO SPACE								
	Length (A)	Width (B)	Height (C)	Front (D)	Rear (E)	Height of rear opening (F)	Floor width of opening (G)	Maximum opening above tailgate (H)	Width between wheelhouses (I)	Length, front seat to end of gate (J)	Length, front seat to closed gate (K)	Length, second seat to end of gate (L)	Loading height of tailgate (M)	Cargo-space volume (cu. ft.)
AMBASSADOR	202.6	71.3	58.6	59.8	60.1	24.6	50.8	48.0	43.1	104.7	82.4	70.9	25.0	80.0
BUICK	211.8	78.1	57.6	62.6	62.1	35.1	48.0	61.2	43.4	101.9	84.0	65.1	30.8	64.5
CHEVROLET	209.1	77.7	58.5	62.2	62.6	30.3	47.9	53.3	45.5	105.0	91.5	74.3	26.1	88.0
CHRYSLER	218.0	79.6	57.2	63.0	62.0	28.6	46.0	50.7	45.7	119.7	98.6	85.6	27.8	95.0
DE SOTO	218.1	78.3	57.2	63.0	62.0	28.6	46.0	50.7	45.7	119.7	98.6	85.6	27.5	95.0
DODGE	216.2	78.3	57.3	63.0	62.0	28.6	46.0	50.7	45.7	119.7	98.6	85.6	27.5	95.0
EDSEL	205.4	77.1	58.8	60.3	60.2	26.8	45.7	59.6	42.0	106.4	85.4	73.2	24.0	78.6
FORD	202.7	78.0	58.6	60.3	60.3	28.3	45.7	59.6	42.0	107.6	86.6	73.2	26.9	78.7
MERCURY	214.2	77.4	58.3	61.3	62.9	27.5	49.3	45.0	44.1	126.6	93.4	62.5	25.6	87.4
OLDSMOBILE	208.2	78.8	58.1	62.0	58.8	28.0	47.0	48.0	43.4	96.2	84.0	65.4	29.0	64.4
PLYMOUTH	213.3	79.3	56.9	63.0	62.0	28.6	46.0	50.7	45.7	119.7	98.6	85.6	27.3	95.0
PONTIAC	210.5	77.4	59.1	62.0	62.6	30.0	47.1	53.0	46.4	109.3	91.1	74.7	23.8	72.5
RAMBLER	193.6	71.3	57.8	59.8	60.1	24.6	50.8	48.0	43.1	104.7	82.4	70.9	25.8	80.0
STUDEBAKER	202.4	75.8	61.5	59.5	56.5	31.3	45.0	45.0	41.8	92.0	72.0	66.0	27.5	65.0

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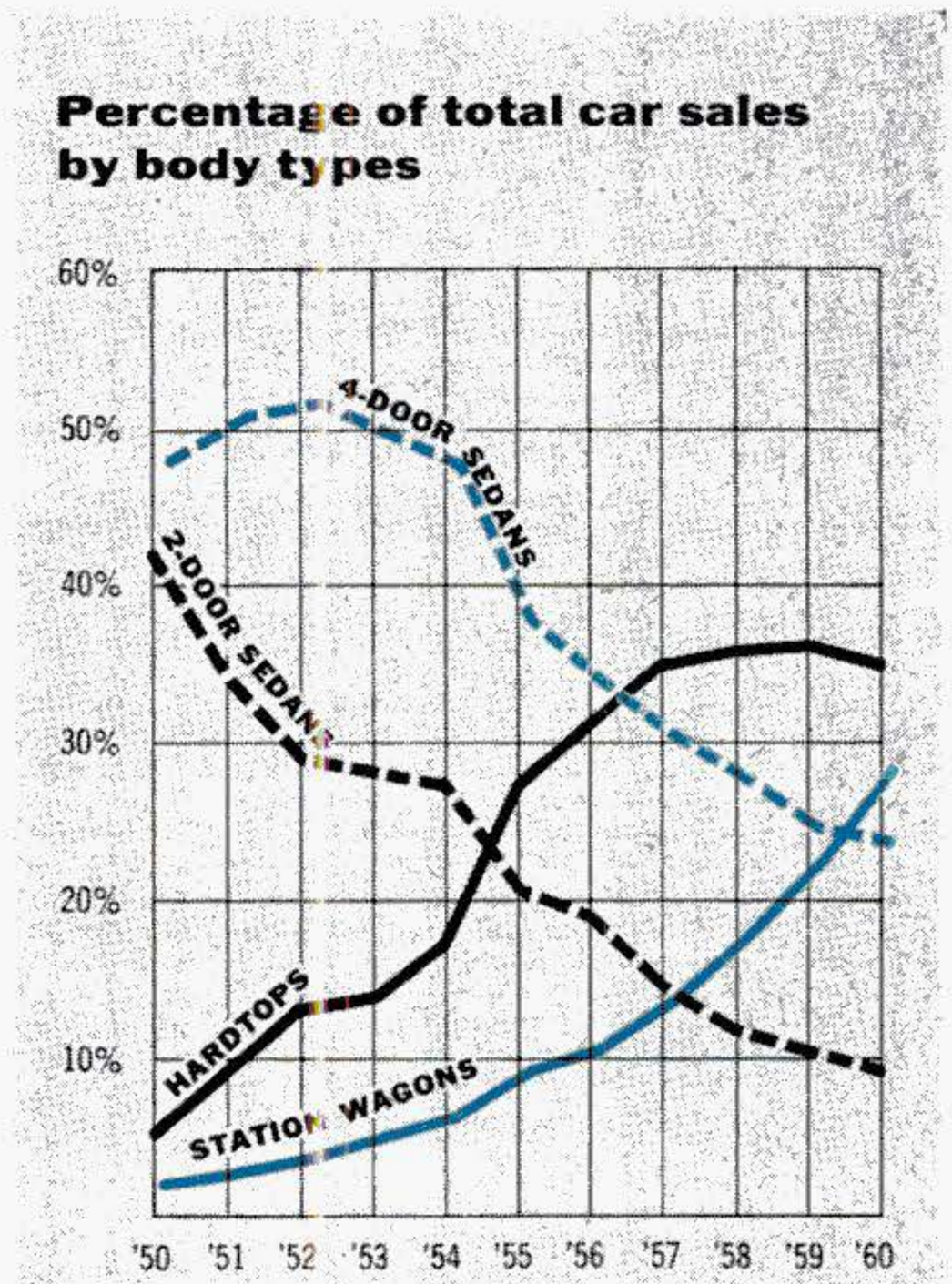
What's Happening to the Automobile Business?

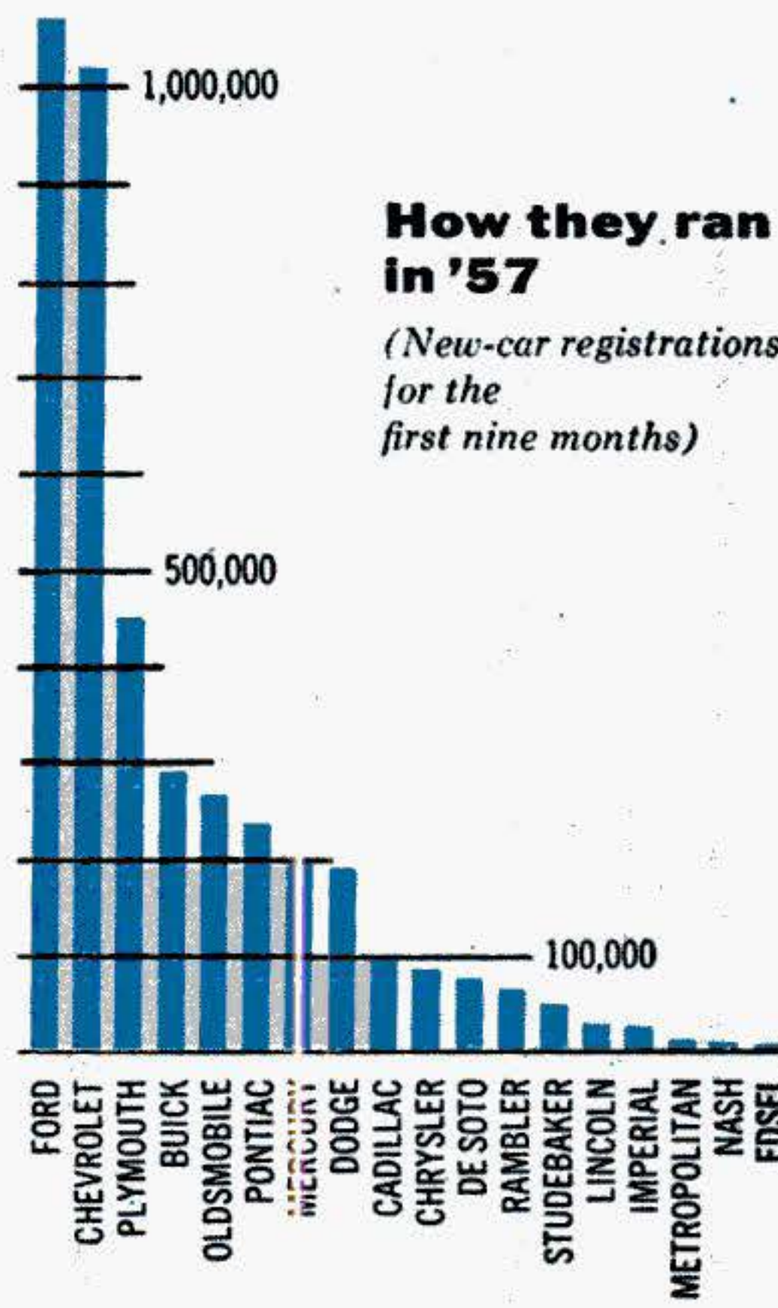
SOME surprising changes are taking place in the pattern of U. S. car sales. The four-door family sedan appears headed for oblivion; station wagons are coming up. Sharply defined price brackets are gone. And the big new market is clustering in the medium-priced field.

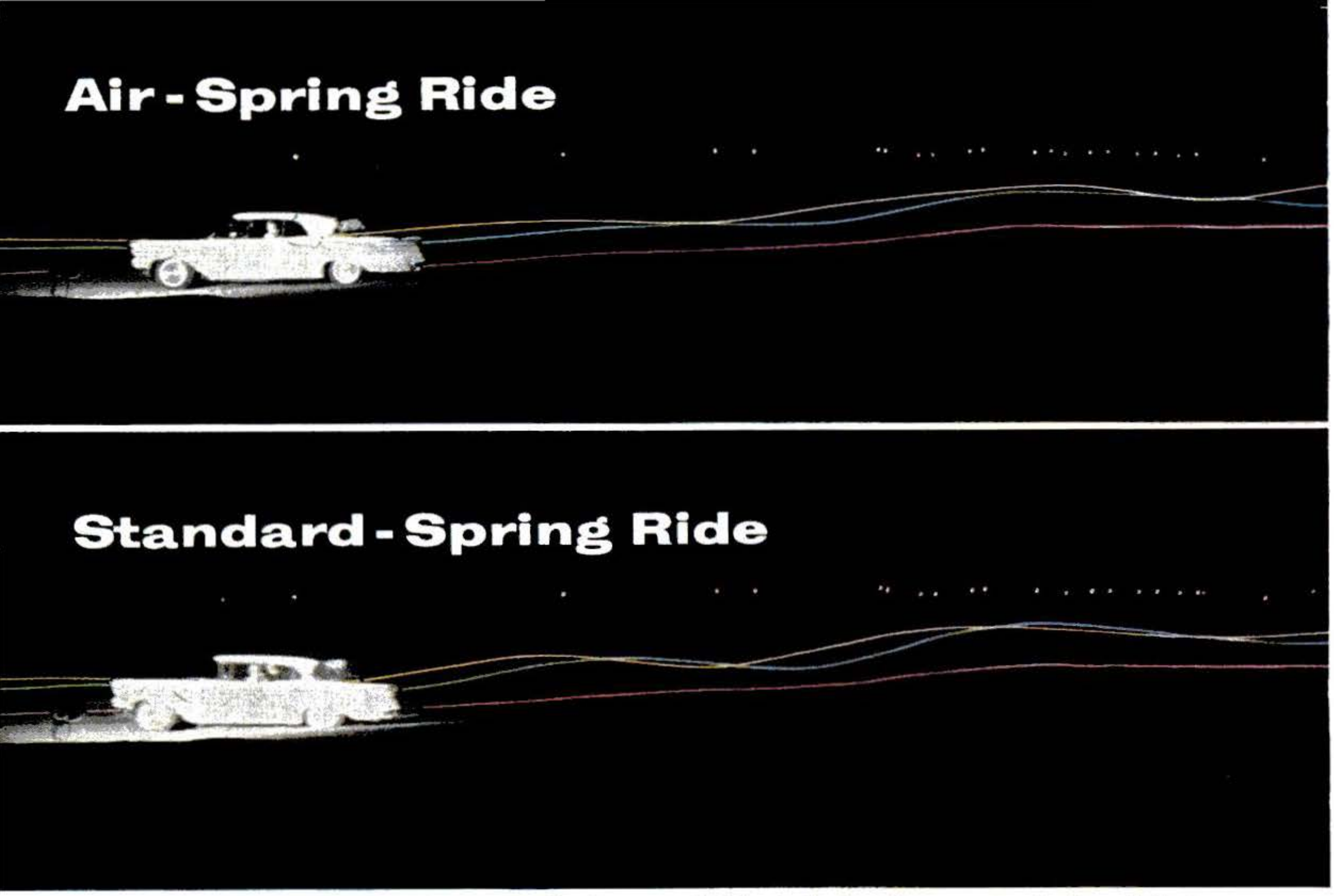
Body types: The sales picture is shifting rapidly and consistently. In 1950, nine out of 10 cars sold were sedans, split about evenly between two- and four-door. In 1954, the hardtop passed the two-door. Last year, the Automobile Manufacturers Association says, hardtops beat four-doors, and station wagons outsold two-doors. If the present trend—projected in the chart at right—continues, wagons will outsell four-door sedans before 1960.

Price brackets: Here's another startling development. As long as most of us can remember, cars have been divided into three categories: low-, medium- and high-priced. Now these distinctions are blurring. As "low-priced" cars move up to the $2,500-plus field, medium-priced cars are making a new sales pitch: Why settle for a "small" car when you can get a big one for a few dollars more? Cars produced by the same corporation are competing furiously—Buick, Olds and Pontiac with Chevrolet; Edsel and Mercury with Ford; De Soto and Dodge with Plymouth. Meanwhile, economy cars like Rambler and Scotsman, and smaller foreign cars—VW, GM's Vauxhall and Opel, the French Renault, the little English Fords and a dozen others—are moving in to fill the vacuum created as Ford-Chevy-Plymouth abandon the low-priced field.

Sales outlook: Despite an increase of more than 800,000 new families each year, '56 and '57 car sales failed to keep pace. Sales for '57 are expected to fall short of the 6,000,000 mark (see chart for nine-month totals, and how they ran). But Detroit is looking hopefully for a whopping year in 1958. One reason: A lot of owners who bought their present cars in the record-sales year of 1955—7,200,000 cars sold—will have finished paying for them this year and will be ready to buy again.







DIRECT PHOTOGRAPHIC COMPARISON of air-spring ride with standard-spring ride shows remarkable similarity. But . . . standard car is bottoming on severe bumps, and riding for short

The Truth About Air Springs

A frank appraisal of what Detroit's newest extra-cost option will mean to you in terms of ride, handling and maintenance

By Hubert Luckett

AIR SPRINGS are the big technical news from Detroit for '58. Two of the Big Three—Ford and GM—are offering a true air ride as an option on all lines. Chrysler, presently standing pat with its torsion-bars-in-front system, is reportedly ready to go with its own version if air suspension catches on with the buying public. Even American Motors is prepared to sell the customer an air-bags-in-back rig.

Air suspension is not new. Buses and trucks have used it for years, and there are hundreds of patents on it that go back as far as 1847. So why the sudden vogue for air springs? To get the answers, this writer tried out a wide assortment of air-suspension cars, and then picked the brains of development engineers.

Thumbnail conclusions:

- Air suspension's greatest virtue is automatic, constant height control regardless of load.
- The contrast between the ride of a standard '58 car and one with air springs is very slight for *normal* driving.
- Subtle differences that show up when the cars are hard pressed may be due as much to other suspension changes in 1958.
- In spite of variations in design, the

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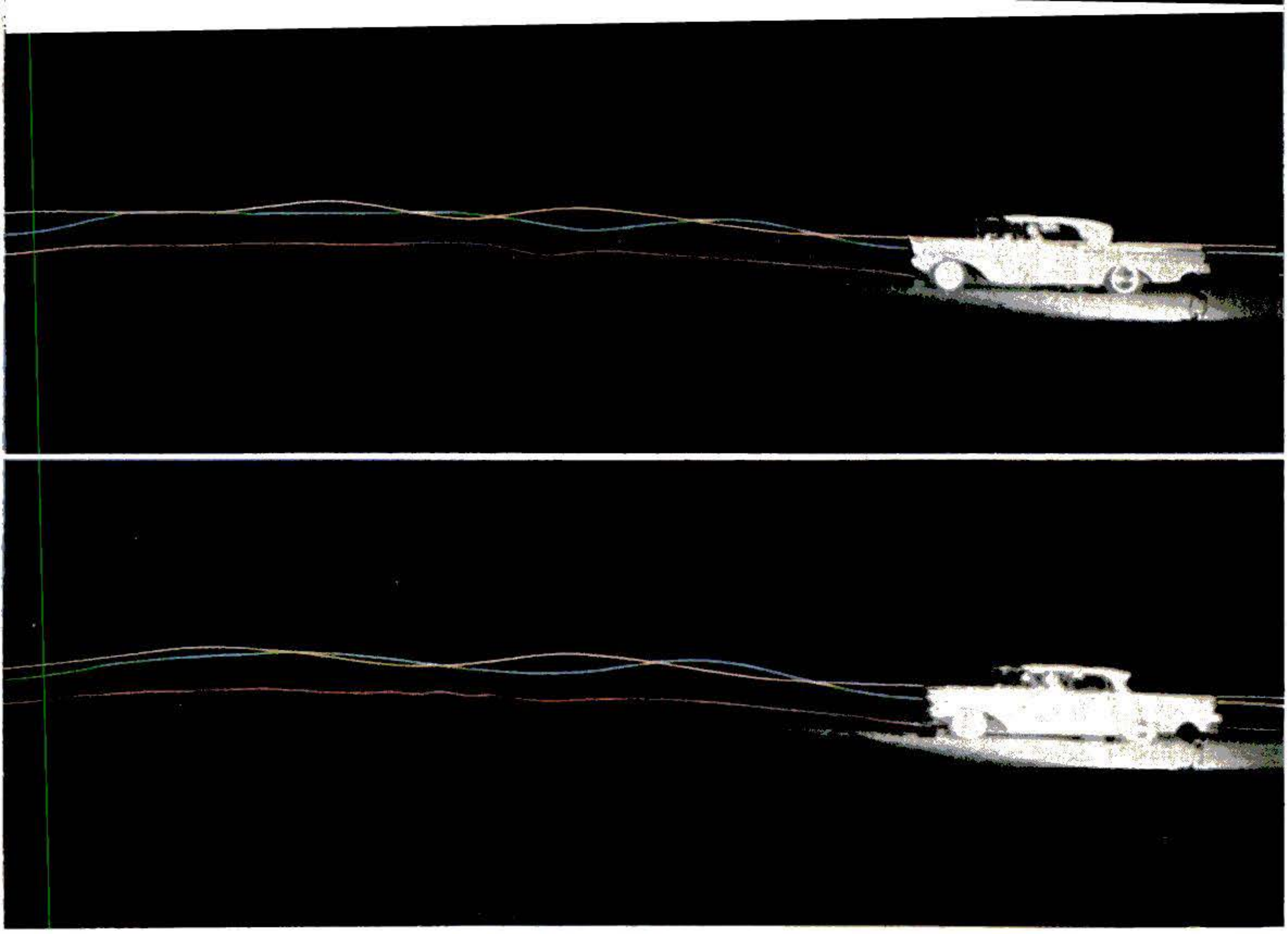
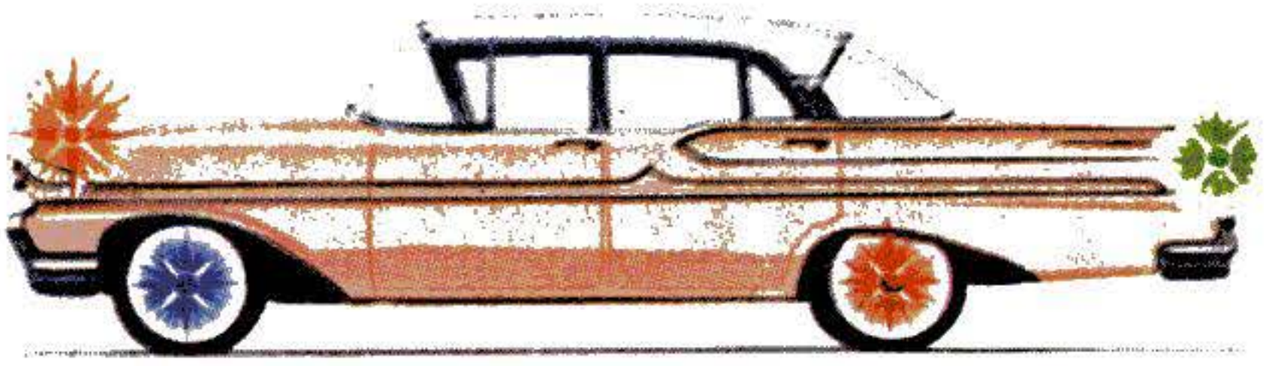


stretches on its axles, as evidenced by flattening of tracer streaks. Its tail (green light) is bouncing higher in the air. Air-spring car comes out of bumps with less pitch of its rear end.

How the pictures were taken

COLORED LIGHTS DRAW A PICTURE of the ride. With shutter of the camera open, lights mounted as on the car sketched at right registered as colored streaks when the cars drove past. A flash at start and finish of the test ride recorded the image of the car.



ride of all air-suspension cars is remarkably similar.

• '58 is the guinea-pig year for air suspension. If no serious weaknesses show up, look for changes: refinements in bags, redesign of cars. 1958's air suspension is mostly still an extra on cars built to ride on steel, not air.

If there's a disparity between these conclusions and the advertising brags you have heard, don't jump to the conclusion that air suspension is just a sales gimmick. The fact is that air suspension (or something like it) is inevitable if the present direction of car design continues.

The frets and inconveniences that have been aggravated by the trend to lower car heights and softer ride are many:

• Unloaded, the car stands at the curb with its rear end up in the air like an unballasted tanker.

• Loaded, the headlights search the treetops (or blind other drivers) and rear vision is shut off.

• Loaded, it is too willing to bottom.

• Loaded or not, on even moderately abrupt inclines the bumper guards may drag bottom.

From the auto engineer's standpoint, the choice of spring rate—the measure of stiffness—in conventional steel springs presents a problem. Stiff springs give a

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high rate, limber springs a low. It's the low rate that gives you a soft ride.

Steel springs can be made as soft as you like, but they have only one spring rate built into them. If they are to work with widely varying loads, they must have plenty of room to flex. The car must stand high when unloaded to allow room for compression under load. While a soft spring gives the best smooth-road ride, it lets the wheels flail around too much when the going gets rough.

So this is the compromise that becomes more painful as cars get lower and the space for wheel jounce and rebound becomes more limited. It's a mean choice between the soft boulevard ride and adequate handling on bumpy roads, between low roof lines and load-carrying ability.

The variable spring rate made possible with air suspension provides a double-barreled solution to this dilemma. The rear springs can be pumped up to take care of an increase in dead load, and all four springs can be designed to *vary* in spring rate with wheel deflection. In the normal ride range they have a low rate, but when the wheel hits a bump or hole, a higher spring rate takes over.

How does it feel? The ride in an air-suspension car is ingratiating. It flows over the bumps and chuck holes like a pat of butter sliding off a stack of hot cakes. It seems almost too yielding to survive a sharp bump without bottoming, or a hard turn without excessive roll. But try a rough grade crossing at a brisk pace and the car shrugs it off like the Queen Mary intersecting the wake of a tug.

But before you plunk down that extra $125 to $200 or so for air bags, make a point of trying a steel-spring version of the same '58 car. One good comparison is the '58 Chevrolet, which has been redesigned to use air springs interchangeably with coil springs. With a couple of hefty passengers in the rear seat, you can put the standard car through the exact same paces, and it would take a highly developed awareness to detect any difference.

For this comparable performance with the steel springs, however, you need the ideal load in the car. Air springs perform equally well with just the driver aboard or with the car loaded. They do the job, moreover, with smaller clearances and lower overall height.

How it works. In all air-suspension systems, the car is supported on four columns of air. The air springs are like

Air-Spring Facts

			SPRING RATE (cycles per min.)		NORMAL DESIGN PRESSURE IN AIR BAGS (psi)		EFFECTIVE AREA OF PISTONS AT DESIGN HEIGHT (sq. in.)		VOLUME OF AIR BAGS (cu. in.)		REGULATED PRESSURE (psi)	RATIO OF SPRING LOAD TO WHEEL LOAD		SUSPENSION TRAVEL BETWEEN TRIM HEIGHT & STRIKE-THROUGH (in.)			
														Front		Rear	
	AVAILABILITY AS AN OPTION	PRICE	Front	Rear	Front	Rear	Front	Rear	Front	Rear		Front	Rear	jounce	rebound	jounce	rebound
BUICK	all models	$188	43	54	100	100	20	10	300	235	125	2:1	1:1	4	4	4.2	5.3
CADILLAC	all models; standard on Eldorado Brougham	$215	41	50	90	90	18.1	26.5	338	221	125	1.8:1	1.3:1	3.9	4.7	4.3	5.5
CHEVROLET	all 8's except fuel injection	$124	53	64	90	52	18	21	n.a.	n.a.	no reg.	1.9:1	1.6:1	3.9	4.3	4.3	5.7
FORD	Fairlane & all station wagons, with 8-cyl. auto. transmission	n.a.	50	55	105	65	19.6	15.8	146	170	160	2:1	1.3:1	3.7	5.6	4	5.5
MERCURY	all models except manual transmission	n.a.	49	63	110	60	25	21	146	130	160	2:1	1.3:1	3.7	5.6	4	4.8
OLDSMOBILE	all models, but only with power steering	$215	46	54	100	100	23	11.5	295	240	150	1.9:1	1:1	2.3	2.4	3.8	5
PONTIAC	all models	$175	52	56	100	100	23.8	21.2	230	204	125	1.8:1	1.3:1	4.5	5	4.1	4.8

n.a. This information not available

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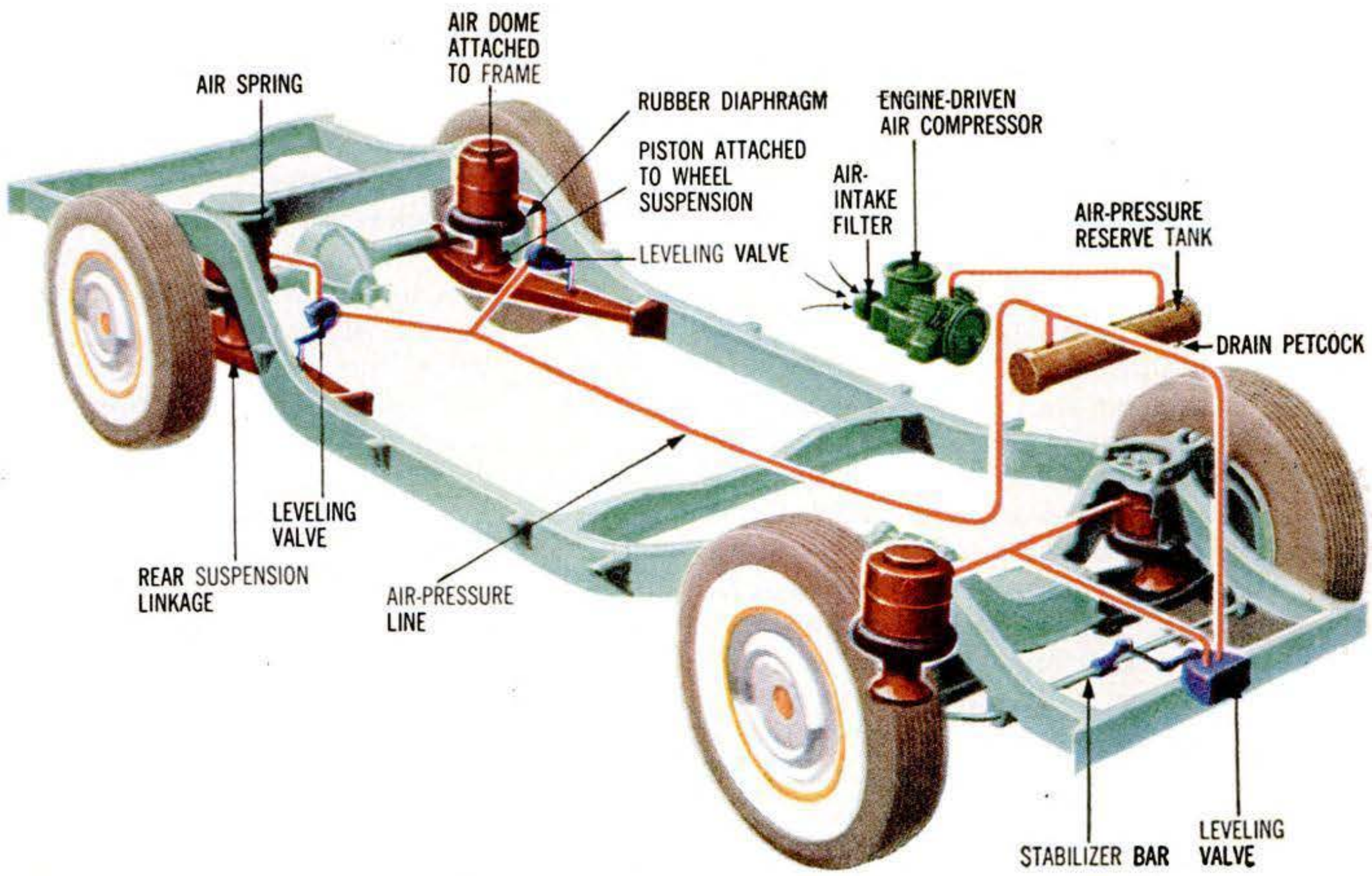

Basic anatomy of air suspension

ESSENTIAL PARTS of an elementary air-suspension system are shown in this schematic drawing. None of the current offerings is quite this simple. The manual override feature and semi-closed or closed system need an exhaust line from the leveling valves piped to a central point. For quick-acting leveling, a secondary air system to each valve is also required.

HIGH-PRESSURE AIR RESERVOIR		POWER TAKEN BY COMPRESSOR (hp.)	LEVELING VALVES		MANUAL OVERRIDE VALVE	SERVICE
Capacity (cu. in.)	Max. pressure (psi)		Front	Rear		
820	290	1.5	1 centered	2	yes	drain air tank at each lubrication or 2,000 mi.
300	270	1.6	1 centered	2	yes	drain air tank at 6,000 mi.
360	250	1.18	2	1 at left rear wheel	no	drain air tank, clean air filter, and half fill alcohol bottle every 1,000 mi.
400	300	1	2	1 centered	no	drain air tank each lubrication; clean air-intake filter every 4,000 mi.
400	300	1	2	1 centered	no	drain air tank at each lubrication; clean air-intake filter every 10,000 mi.
1,500	325	7.5	1 centered	2	yes	drain oil and water separator every 2,000 mi.; clean air-intake filter every 4,000 mi.; drain high-pressure air tank every 10,000 mi.
550	270	2	1 centered	2	yes	drain air tank at each lubrication.

old-fashioned tire pumps. The barrel of the pump is attached to the frame and the plunger is connected to the wheel. The pressure of air trapped in the barrel supports the load. The compressibility of the air supplies the springiness.

The tire-pump analogy is crude; there are two important differences in the actual practice:

1. The sliding seal of the pump leather against the barrel is replaced by a rolling seal. A bellowslike diaphragm makes an airtight union between the piston and the cylinder.

2. The effective area of the piston is made to vary with its position in the air chamber. The area increases when the piston moves farther into the cylinder and it decreases when withdrawn.

The rolling seal provides a positively closed air chamber—as airtight as a tubeless tire. The variable-area piston makes the spring progressively stiffer when you exceed smooth-road wheel deflection.

One of these simple air springs substituted for each of the steel springs under a car would give you several theoretical

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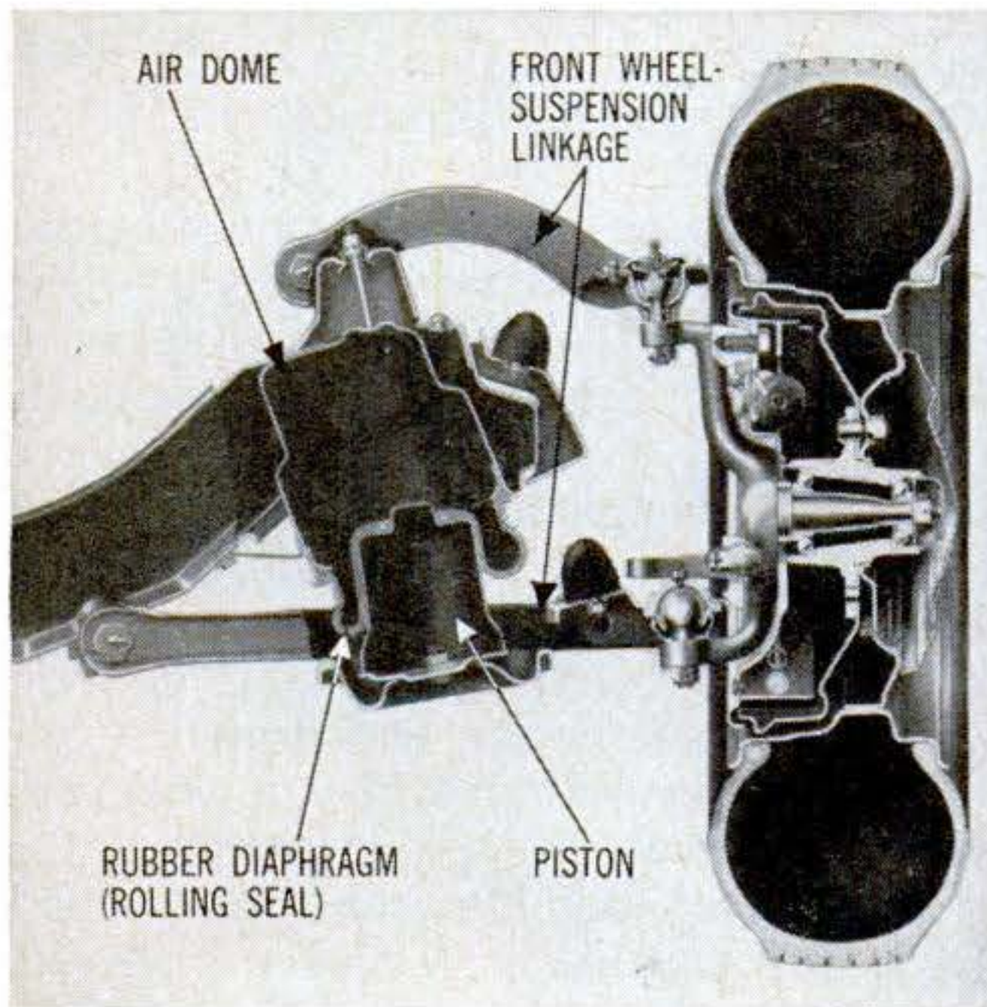
advantages of air suspension. This was done, in fact, on one early experimental job. The engineers pumped up the air bags on a test car to give a normal trim height for the load they were carrying, and sealed each one. Then they took a 300-mile cross-country drive. You can guess what happened: At the end of the trip the car was riding four inches higher than at the start.

The heat generated from the constant flexing of the springs had expanded the air in the chambers, increasing the pressure and forcing the pistons out.

Why it gets complicated. First: There must be some way to take care of pressure changes in the air springs from normal ride action, and from changes in outside temperature, altitude and barometric pressure.

So you have to rig up a valve that will bleed off some air when the pressure gets too high. Then, if conditions change, you'll need to put some air back in again. To do this, you obviously have to add an air compressor and storage tank. And you'll need assorted plumbing to connect everything together.

Now you have a practical air suspension that will do everything steel springs will—and you have, further, the advantages of variable rate. But, like steel springs, it has to be designed to carry a particular load. It will ride too high with less-than-design load and it will be bumping the axles if overloaded. This brings us to a second design requirement: The suspension system should work equally well with any load and maintain constant car height automatically.



VARIABLE AREA is obtained by the outside contour of the piston. Cutaway drawing of an air spring in the front wheel suspension shows how rolling seal closely follows this contour.

This is simpler than it sounds. All that's needed is to change those *pressure*-sensing valves to *position*-sensing valves. In other words, instead of having the pressure inside the spring control the release or admission of air, it is controlled by the position of the wheel relative to the frame. The valve is mounted on the frame and connected by a lever to the axle. If the frame is too high off the axle, it releases air; if it is too low, it admits more air to the springs.

If you put one position-sensing valve at each of the four wheels, there'd be trouble—they'd fight each other to control the level of the car. When one made a correction, it would affect the position of another, which would then try to correct and so on. The process would be like trying to saw off the four legs of a table so it won't rock. But a three-legged stool doesn't present this problem. And therein lies the solution for air suspension: Only *three* leveling valves are used.

Fresh or re-used air? A lot of air is needed in the course of a day's drive to supply the needs of air springs, with their constant releasing and taking in. Because air taken from the atmosphere contains water as well as dirt and dust, re-using the same air means less possibility of contamination.

There is, however, a big difference in the importance given to this problem by different makers. Choices range from the completely open system (with all replaced air coming from the outside) used by Cadillac, Ford and Mercury, through the semiclosed system of Chevrolet, Pontiac and Buick, to Oldsmobile's completely closed system.

The open system requires only one air tank and a single pipe going to each leveling valve. The exhaust from the spring is to the outside air.

The semiclosed system requires a return line from the leveling valve to a junction block to collect exhaust air and return it to the compressor. This system can re-use most of the air when it is running, but needs replacement air to get started or to meet heavy demands.

[Continued on page 240]

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Facts and Figures on the '58 Cars

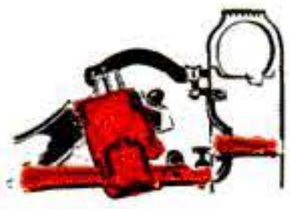
What's new? This year, just about everything. Every maker—except Chrysler, who's pretty much sticking with a good thing—has reworked his cars from headlights to tail fins. Here's a quick rundown:

Horsepower is up, of course. But not much—an average of 12 over last year. The power race seems to be leveling off, despite such bombs as Merc's 400-hp. job.

No slackening, though, in rising compression ratios. And with them go appetites for expensive premium fuel. A third of the cars expected to be built this year will have ratios of 10:1 or more (nine percent did last year). More than half will demand premium fuel.

You'll save some on upkeep. Half the cars-to-be-built are designed to run 4,000 miles or more between oil changes. Not one suggests a 1,000-mile change. But you'll buy more oil when you do change —crankcase capacities are up.

Basic dimensions have changed little. A few cars are longer, but the increase averages out to a bare inch. Width and interior room are close to last year's.

Accessories abound. Hottest for '58 is air springing  (see p. 108), optional on nearly all makes. Note that top-of-the-line models are showing up with most extras as standard equipment.

Prices? Up. Again. The strictly mythical list prices jumped $50 (in the "low-priced field") to $250 (on luxury jobs).

For specifics — car by car, engine by engine, on everything from brake-lining area to leg room to air-conditioner prices—turn the page.

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Facts and Figures on

MAKE AND MODEL		TYPE OF ENGINE	DISPLACEMENT (cu. in.)	HORSEPOWER AT WHAT R.P.M.	HORSEPOWER PER CUBIC INCH OF DISPLACEMENT	WEIGHT PER HORSEPOWER (lb.)[a]	TORQUE AT WHAT R.P.M. (lb.-ft.)
AMBASSADOR		OHV V-8	327	270 @ 4,700	.83	12.8	360 @ 2,600
BUICK	Special	OHV V-8	364	250 @ 4,400[b]	.69	16.6	380 @ 2,400[b]
	Century Super Roadmaster Limited	OHV V-8	364	300 @ 4,600	.83	14.2	400 @ 3,200
CADILLAC	Series 62 Series 60 Series 75	OHV V-8	365	310 @ 4,800	.85	15.0	405 @ 3,100
	Eldorado Brougham	OHV V-8	365	335 @ 4,800	.92	15.7	405 @ 3,400
CHEVROLET	All Series	OHV 6	236	145 @ 4,200	.61	23.7	215 @ 2,400
		OHV V-8	283	185 @ 4,600	.65	18.7	275 @ 2,400
		OHV V-8	348	250 @ 4,400	.72	13.8	355 @ 2,800
CHRYSLER	Windsor	OHV V-8	354	290 @ 4,600	.82	13.4	385 @ 2,000
	Saratoga	OHV V-8	354	310 @ 4,600	.88	13.3	405 @ 3,200
	New Yorker	OHV V-8	392	345 @ 4,600	.88	12.1	450 @ 2,800
	300-D	OHV V-8	392	380 @ 5,200	.97	11.3	435 @ 3,600
CONTINENTAL		OHV V-8	430	375 @ 4,800	.87	13.0	490 @ 3,100
CORVETTE		OHV V-8	283	230 @ 4,800	.81	12.1	300 @ 3,000
DE SOTO	Firesweep	OHV V-8	350	280 @ 4,600	.80	13.1	380 @ 2,400
	Firedome	OHV V-8	361	295 @ 4,600	.82	13.6	390 @ 2,400
	Fireflite	OHV V-8	361	305 @ 4,600	.84	12.9	400 @ 2,800
	Adventurer	OHV V-8	361	345 @ 5,000	.95	n.a.	400 @ 3,600
DODGE	Coronet	L-head 6	230	138 @ 4,000	.60	24.7	208 @ 1,600
		OHV V-8	325	252 @ 4,400	.78	14.2	304 @ 2,400
	Royal	OHV V-8	325	265 @ 4,400	.82	13.4	355 @ 2,800
	Custom Royal	OHV V-8	350	295 @ 4,600	.84	12.3	385 @ 2,800
EDSEL	Ranger Pacer	OHV V-8	361	303 @ 4,600	.84	12.7	400 @ 2,800
	Corsair Citation	OHV V-8	410	345 @ 4,600	.84	12.3	475 @ 2,900
FORD	All Series	OHV 6	223	145 @ 4,200	.65	22.4	212 @ 2,100
	Custom 300 Fairlane	OHV V-8	292	205 @ 4,500	.70	16.3	295 @ 2,400
	Fairlane 500	OHV V-8	332	265 @ 4,600	.80	13.3	360 @ 2,800
IMPERIAL	All Series	OHV V-8	392	345 @ 4,600	.88	13.3	450 @ 2,800
LINCOLN	Both Series	OHV V-8	430	375 @ 4,800	.87	12.7	490 @ 3,100
MERCURY	Monterey	OHV V-8	383	312 @ 4,600	.82	13.2	405 @ 2,900
	Montclair	OHV V-8	383	330 @ 4,800	.86	12.4	425 @ 3,000
	Park Lane	OHV V-8	430	360 @ 4,600	.84	12.3	480 @ 3,000
OLDSMOBILE	88	OHV V-8	371	265 @ 4,400	.72	15.0	390 @ 2,400
	Super 88 98	OHV V-8	371	305 @ 4,600	.82	13.1	410 @ 2,800
PACKARD HAWK		OHV V-8	289	275 @ 4,800	.95	12.7	333 @ 3,200
PLYMOUTH	Plaza Savoy Belvedere	L-head 6	230	132 @ 3,600	.57	24.8	205 @ 1,200
		OHV V-8	318	225 @ 4,400	.71	15.3	330 @ 2,800
	Fury	OHV V-8	318	290 @ 5,200	.91	12.1	330 @ 3,600
PONTIAC	Chieftain Super Chief	OHV V-8	370	240 @ 4,500	.65	15.7	354 @ 2,600
	Star Chief Bonneville	OHV V-8	370	255 @ 4,500	.69	15.0	360 @ 2,600
RAMBLER	All Series	OHV 6	196	127 @ 4,200	.65	23.2	180 @ 1,600
		OHV V-8	250	215 @ 4,900	.86	15.3	260 @ 2,500
STUDEBAKER	Scotsman Champion Silver Hawk	L-head 6	186	101 @ 4,000	.54	27.0	152 @ 1,800
	Commander	OHV V-8	259	180 @ 4,500	.77	17.5	260 @ 2,800
	Silver Hawk	OHV V-8	289	210 @ 4,500	.73	15.0	300 @ 2,800
	President	OHV V-8	289	225 @ 4,500	.78	14.8	305 @ 3,000
	Golden Hawk	OHV V-8	289	275 @ 4,800	.95	12.3	333 @ 3,200

NOTES: n.a. This information not available at press time. [a]For the lowest-priced four-door sedan (or equivalent model if there is no sedan) in the series listed. [b]With Dynaflow. [c]3.36 on Series 75.

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'58 Cars: Engines

BORE AND STROKE (in.)	COMPRESSION RATIO (to 1)	FUEL REQUIRED (regular or premium)	OPTIONAL EXTRA POWER		REAR-AXLE RATIOS (to 1)		
			Horsepower	Torque	Automatic Transmission	Manual Transmission	Overdrive
4.00 x 3.25	9.7	P	—	—	3.15	4.10	4.10
4.13 x 3.40	9.5[b]	P[b]	—	—	3.23	3.58	—
4.13 x 3.40	10.0	P	—	—	3.23	—	—
4.00 x 3.63	10.3	P	335 @ 4,800	405 @ 3,400	3.07[c]	—	—
4.00 x 3.63	10.3	P	—	—	3.36	—	—
3.56 x 3.94	8.3	R	—	—	3.36	3.55	4.11
3.88 x 3.00	8.5	R	250 @ 5,000[d]	305 @ 3,800[d]	3.36	3.55	4.11
4.13 x 3.25	9.5	P	280 @ 4,800	355 @ 3,200	3.36	3.55	—
3.94 x 3.63	10.0	P	—	—	2.93	3.73	—
3.94 x 3.63	10.0	P	—	—	2.93	—	—
4.00 x 3.90	10.0	P	—	—	2.93	—	—
4.00 x 3.90	10.0	P	390 @ 5,200	435 @ 3,600	3.31	—	—
4.30 x 3.70	10.5	P	—	—	2.87	—	—
3.88 x 3.00	9.5	P	290 @ 6,200[d]	290 @ 4,400[d]	3.55	3.70	—
4.06 x 3.38	10.0	P	295 @ 4,600	385 @ 2,800	3.31	3.54	—
4.12 x 3.38	10.0	P	—	—	3.15	3.54	—
4.12 x 3.38	10.0	P	—	—	3.15	—	—
4.12 x 3.38	10.3	P	—	—	3.31	—	—
3.25 x 4.63	8.0	R	—	—	3.73	3.91	—
3.69 x 3.80	8.5	R	333 @ 4,800[d]	400 @ 3,600[d]	3.31	3.54	—
3.69 x 3.80	9.0	P	333 @ 4,800[d]	400 @ 3,600[d]	3.15	3.54	—
4.06 x 3.38	10.0	P	333 @ 4,800[d]	400 @ 3,600[d]	3.15	3.31	—
4.05 x 3.50	10.5	R	—	—	2.91	3.56	3.70
4.20 x 3.70	10.5	R	—	—	2.91	—	—
3.62 x 3.60	8.6	R	—	—	3.56	3.70	3.70
3.75 x 3.30	9.1	R	300 @ 4,600[d]	395 @ 2,800[d]	3.10	3.56	3.70
4.00 x 3.30	9.5	R	300 @ 4,600[d]	395 @ 2,800[d]	2.91	3.56	3.56
4.00 x 3.90	10.0	P	—	—	2.93	—	—
4.30 x 3.70	10.5	P	—	—	2.87	—	—
4.30 x 3.30	10.5	P	400 @ 5,200	480 @ 3,200	2.69	3.56	3.56
4.30 x 3.30	10.5	P	400 @ 5,200	480 @ 3,200	2.69	—	—
4.30 x 3.70	10.5	P	400 @ 5,200	480 @ 3,200	2.91	—	—
4.00 x 3.69	10.0	P	312 @ 4,600	415 @ 2,800	3.07	3.64	—
4.00 x 3.69	10.0	P	312 @ 4,600	415 @ 2,800	3.23[e]	3.64[e]	—
3.56 x 3.63	7.8	—	—	—	3.31	—	—
3.25 x 4.63	8.0	R	—	—	3.73	3.73	4.10
3.91 x 3.31	9.0	R	315 @ 5,000[d]	370 @ 3,600[d]	3.31	3.54	3.91
3.91 x 3.31	9.3	P	315 @ 5,000[d]	370 @ 3,600[d]	3.31	3.54	—
4.06 x 3.56	8.6	R	310 @ 4,800[d]	400 @ 3,400[d]	3.23	3.42	—
4.06 x 3.56	8.6	R	310 @ 4,800[d]	400 @ 3,400[d]	3.23	3.42	—
3.13 x 4.25	8.7	R	138 @ 4,500	185 @ 1,800	3.31	3.78	4.38
3.50 x 3.25	8.7	R	—	—	3.55	4.10	4.44
3.00 x 4.38	7.8	R	—	—	3.54[f]	4.10[g]	4.56[g]
3.56 x 3.25	8.3	R	195 @ 4,500	265 @ 3,000	3.31	3.54	3.73
3.56 x 3.63	8.3	R	225 @ 4,500	305 @ 3,000	3.31	3.54	3.92
3.56 x 3.63	8.3	R	—	—	3.31	3.54	3.92
3.56 x 3.63	7.8	P	—	—	3.31	—	4.27

[d]Option giving highest power listed; other engine options also available. [e]Hydra-Matic, with 3.42:1 ratio, standard on "98." [f]Automatic transmission not offered on Scotsman. [g]3.54 on Scotsman.

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Facts and Figures on

MAKE AND MODEL		WHEELBASE (in.)	OVERALL LENGTH (in.)	WIDTH (in.)	SHIPPING WEIGHT (lb.)[a]	WEIGHT PER SQ. IN. OF BRAKE-LINING AREA[a]	OVERALL STEERING RATIO		TURNING-CIRCLE DIA., CURB TO CURB (ft.)	TIRE SIZE
							Manual	Power		
AMBASSADOR		117.0	200.2	72.2	3,456	21.7	25.6	25.4	39.8	8.00 x 14
BUICK	Special	122.0	211.8	78.1	4,150	22.7	28.8	19.7	43.2	7.10 x 15
	Century									
	Super	127.5	219.1	79.8	4,518	24.7	—	19.7	44.5	7.60 x 15
	Roadmaster	127.5	219.1[d]	79.8	4,602	25.1	—	19.7	44.5	8.00 x 15
	Limited									
CADILLAC	Series 62	129.5	216.8	80.0	4,647	22.0	—	19.5	43.4	8.00 x 15
	Series 60	133.0	225.3	80.0	4,783	22.8	—	19.5	45.0	8.00 x 15
	Series 75	149.8	237.1	80.0	5,317	22.8	—	19.5	51.7	8.20 x 15
	Eldorado Brougham	126.0	216.3	78.5	5,315	24.3	—	19.5	42.0	8.40 x 15
CHEVROLET	Delray	117.5	209.1	77.7	3,442	21.9	23.0	23.0	41.6	7.50 x 14
	Biscayne									
	Bel Air									
CHRYSLER	Windsor	122.0	218.1	79.6	3,895	16.8	30.0	19.1	43.5	8.00 x 14
	Saratoga	126.0	220.2	79.6	4,120	16.4	—	19.4	46.9	8.50 x 14
	New Yorker									
	300-D	126.0	220.2	79.6	4,305	17.3	—	19.4	46.9	9.00 x 14
CONTINENTAL		131.0	229.0	80.1	4,888	18.6	—	20.1	44.4	9.00 x 14
CORVETTE		102.0	177.2	72.8	2,781	17.7	21.0	—	36.5	6.70 x 15
DE SOTO	Firesweep	122.0	216.5	78.3	3,660	15.8	30.0	19.1	43.5	8.00 x 14
	Firedome	126.0	218.6	78.3	4,015	16.0	30.6	19.4	46.9	8.50 x 14
	Fireflite									
	Adventurer	126.0	218.6	78.3	n.a.	n.a.	30.6	19.4	46.9	8.50 x 14
DODGE	Coronet	122.0	213.8	78.3	3,550	15.4	30.0	19.1	43.5	7.50 x 14
	Royal									
	Custom Royal									
EDSEL	Ranger	118.0	213.2	78.8	3,805	22.0	31.8	25.1	41.7	8.00 x 14
	Pacer									
	Corsair	124.1	218.9	79.8	4,235	20.6	31.8	24.0	43.2	8.50 x 14
	Citation									
FORD	Custom 300	116.0	202.0	78.0	3,347	18.6	27.0	27.0	40.1	7.50 x 14
	Fairlane	118.0	207.0	78.0	3,515	19.5	27.0	27.0	40.6	7.50 x 14
	Fairlane 500									
IMPERIAL	Imperial	129.0	225.8	81.2	4,590	18.3	—	19.4	48.1	9.50 x 14
LINCOLN	Capri	131.0	229.0	80.1	4,754	18.2	—	20.1	44.4	9.00 x 14
	Premiere									
MERCURY	Monterey	122.0	213.2	81.1	4,112	20.0	31.0	24.0	43.7	8.00 x 14
	Montclair									
	Park Lane	125.0	220.2	81.1	4,502	21.9	—	24.0	44.6	8.50 x 14
OLDSMOBILE	88	122.5	208.2	78.8	3,985	20.8	29.9	22.7	42.0	8.50 x 14
	Super 88									
	98	126.5	216.7	78.8	4,316	22.5	—	22.7	43.0	8.50 x 14
PACKARD HAWK		120.5	205.1	72.6	3,470	20.1	24.5	21.5	40.0	8.00 x 14
PLYMOUTH	Plaza	118.0	206.0	79.3	3,450	18.8	26.8	19.1	42.3	7.50 x 14
	Savoy									
	Belvedere									
	Fury	118.0	206.0	79.3	3,510	19.1	26.8	19.1	42.3	8.00 x 14
PONTIAC	Chieftain	122.0	210.5	77.4	3,735	21.0	27.0	22.0	41.7	8.00 x 14
	Super Chief	124.0	215.5	77.4	3,770	21.2	27.0	22.0	42.1	8.00 x 14
	Star Chief									
	Bonneville	122.0	211.7	77.4	3,710	20.8	27.0	22.0	41.7	8.00 x 14
RAMBLER	DeLuxe	108.0	191.2	72.2	3,300	20.8	24.0	18.4	37.6	7.50 x 14
STUDEBAKER	Scotsman	116.5	202.4	75.8	2,735	18.5	21.5	—	40.0	6.40 x 15
	Champion	116.5	202.4	75.8	3,155	21.3	21.5	24.5	38.5	6.40 x 15
	Commander	116.5	202.4	75.8	3,155	18.3	24.5	24.5	38.5	7.50 x 14
	President	120.5	206.4	75.8	3,325	19.3	24.5	24.5	40.0	8.00 x 14
	Silver Hawk	120.5	203.9	71.3	3,145	18.2	24.5	24.5	40.0	7.50 x 14
	Golden Hawk									

NOTES: n.a. This information not available at press time. [a]For the lowest-priced four-door sedan with eight-cylinder engine (or nearest equivalent model) in the series listed. [b]All prices include Federal excise tax and preparation and handling charges, but no other taxes or shipping charges. Base price

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'58 Cars: Bodies and Prices

	LEG ROOM (in.)		HEAD ROOM (in.)		HIP ROOM (in.)		PRICE[b]							
	Front	Rear	Front	Rear	Front	Rear	Base (8-cyl. engine)	Automatic Transmission	Power Steering	Power Brakes	Air Conditioning	Radio	Heater	Air Springs
	43.0	40.0	36.0	35.0	59.8	60.1	$2,587	$230	$ 90	$ 40	$398[c]	$ 99	$ 83	n.a.
	43.0	41.7	34.9	33.5	62.6	62.1	2,700	220	108	40	430	102	102	$188
							3,316	std.	108	40	430	102	102	188
	43.5	44.5	36.4	35.1	65.7	65.0	3,789	std.	std.	40	430	102	102	188
	43.2	44.1	35.8	34.5	65.5	64.8	4,667	std.	std.	std.	430	102	102	188
							5,112	std.	std.	std.	430	102	102	188
	45.0	45.2	35.0	34.9	65.2	65.0	4,891	std.	std.	std.	474	164	128	200
	45.0	45.3	33.9	34.8	65.0	65.0	6,232	std.	std.	std.	474	164	128	200
	43.6	n.a.	36.6	35.7	65.5	57.9	8,460	std.	std.	std.	474	164	128	200
	43.7	39.7	35.5	34.8	61.3	60.7	13,074	std.	std.	std.	474	164	128	std.
	44.6	42.7	35.0	34.2	62.1	63.1	2,262	188	70	38	468[c]	63	49	124
							2,397	188	70	38	468[c]	63	49	124
							2,547	188	70	38	468[c]	63	49	124
	45.5	43.0	35.7	34.5	63.0	62.7	3,129	220	108	40	506[c]	100	93	—
	45.5	43.0	35.7	34.5	63.0	62.7	3,818	std.	std.	40	506[c]	100	93	—
							4,295	std.	std.	40	506[c]	100	93	—
	45.5	38.0	34.4	33.7	63.0	56.0	n.a.	std.	std.	std.	506[c]	100	93	—
	44.4	42.9	35.0	34.1	61.0	65.1	6,072	std.	std.	std.	612[c]	175	136	n.a.
	44.2	—	34.7	—	49.1	—	3,631	188	—	—	—	144	97	—
	45.5	43.0	35.7	34.5	63.0	62.7	2,773	180	106	39	492[c]	94	90	—
	45.5	43.0	35.7	34.5	63.0	62.7	3,035	220	106	39	492[c]	94	90	—
							3,527	std.	106	39	492[c]	94	90	—
	45.5	38.0	34.4	33.7	63.0	56.0	4,016	std.	106	39	492[c]	94	90	—
	45.5	42.5	35.7	34.5	63.0	62.7	2,647	180	92	38	459[c]	87	84	—
							2,802	220	92	38	459[c]	87	84	—
							3,030	220	92	38	459[c]	87	84	—
	43.1	40.7	33.9	33.6	60.0	60.1	2,592	218	85	38	418[c]	95	93	n.a.
							2,735	218	85	38	418[c]	95	93	n.a.
	44.2	43.4	33.9	32.8	63.5	63.5	3,425	std.	85	38	460[c]	95	93	n.a.
							3,615	std.	85	38	460[c]	95	93	n.a.
	43.1	42.7	34.8	33.6	60.3	60.3	2,246	180	69	37	395[c]	77	46	156
	43.1	40.7	33.9	33.6	60.0	60.1	2,399	180	69	37	395[c]	77	46	156
							2,552	180	69	37	395[c]	77	46	156
	46.0	45.0	35.4	34.2	61.0	60.2	4,945	std.	std.	std.	590[c]	176	141	—
	44.4	46.6	35.0	33.8	61.0	65.5	4,951	std.	std.	std.	612[c]	175	136	n.a.
							5,565	std.	std.	std.	612[c]	175	136	n.a.
	44.1	43.4	33.9	33.2	61.3	62.9	2,721	226	108	38	459[c]	100	91	n.a.
							3,236	std.	108	38	459[c]	100	91	n.a.
	44.1	43.4	34.0	32.8	61.3	62.9	3,944	std.	std.	std.	459[c]	100	91	n.a.
	44.0	41.2	35.1	33.5	62.5	62.1	2,837	231	108	40	430	102	97	215
							3,112	231	108	40	430	102	97	215
	43.8	41.6	34.6	33.1	62.5	62.1	3,824	std.	std.	std.	430	102	97	215
	44.0	36.0	35.7	34.7	59.5	58.0	3,995	std.	91	std.	n.a.	80	71	n.a
	45.5	41.5	35.7	34.2	63.0	62.7	2,242	180	77	38	446[c]	73	69	—
							2,378	180	77	38	446[c]	73	69	—
							2,512	180	77	38	446[c]	73	69	—
	45.5	36.5	33.7	34.0	63.0	56.0	3,032	180	77	38	446[c]	73	69	—
	44.7	41.6	35.0	34.3	62.0	63.1	2,638	231	108	40	430	102	96	188
	44.5	41.4	35.0	34.3	62.0	63.1	2,834	231	108	40	430	102	96	188
							3,071	231	108	40	430	102	96	188
	44.5	37.7	35.0	33.5	63.0	54.5	3,481	231	108	40	430	102	96	188
	43.0	40.0	36.0	35.0	59.8	60.1	2,342	200	80	38	369[c]	82	76	n.a.
	43.0	39.0	36.0	35.0	59.5	59.0	1,874[e]	—	—	—	—	—	std.	—
	49.0	39.0	36.0	35.0	59.5	59.0	2,253[e]	189	69	38	n.a.	60	71	—
	43.0	39.0	36.0	35.0	59.5	59.0	2,378	189	69	38	n.a.	60	71	—
	43.0	41.0	36.0	35.0	59.5	59.0	2,639	189	69	38	n.a.	60	71	—
	44.0	36.0	35.5	34.5	59.5	58.0	2,352	189	69	38	n.a.	60	71	—
							3,282	78	69	38	n.a.	60	71	—

applies to the least expensive four-door sedan (or nearest equivalent), with eight-cylinder engine but no other optional equipment, in each series. [c]Includes a heater. [d]Limited is 227.1 in. long. [e]Six-cylinder engine.

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Are They Building the Car You Really Want?

Popular Science polls car owners on what they like, what they don't—then asks Detroit, "What will you do about it?"

Owners were almost unanimous in wanting more miles per gallon out of their cars

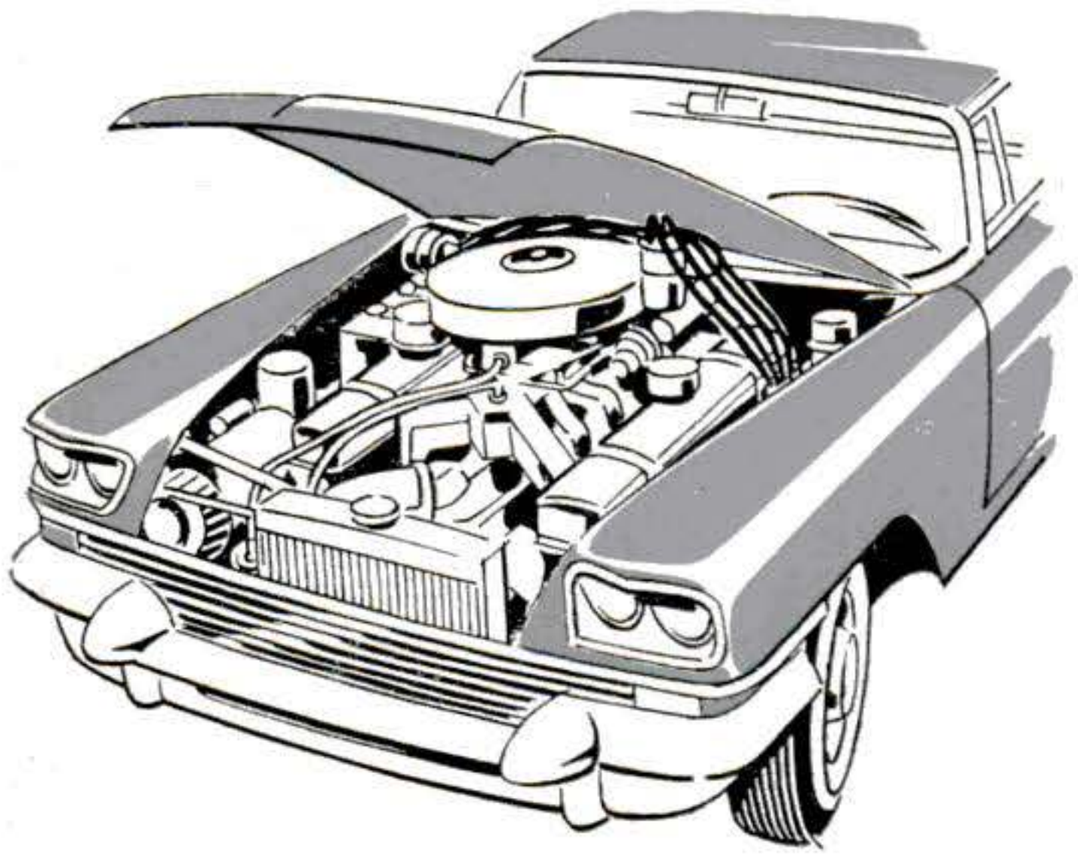
AMERICANS currently spend more money on cars than on any other consumer product except food. And except for a house, a car is the costliest single purchase that most Americans make.

Do we spend all that money because we think modern cars are wonderful? Or, needing a machine for personal transportation, do we simply take what Detroit has to offer?

When we talk about wanting cheaper, smaller and safer cars, is it just talk or would we really buy them?

To explore these questions, POPULAR SCIENCE polled 5,000 car owners and analyzed their answers. We then carried the results to Detroit and, in return for a promise of anonymity, listened to auto engineers sound off. In summary:

- Most people are pretty well satisfied with the main features of the modern cars, *but* . . .
- Detroit would be smart to put more emphasis on gas economy, and better "human" engineering inside its cars;
- The station-wagon boom is here to stay;
- Some forthcoming wonders such as gas-turbine engines appear to be oversold—unless there is a breakthrough of ominous cost barriers.



A common demand was for improved accessibility of engine components for easier servicing

Pinching their pennies. Asked which was the single greatest improvement they wanted for future cars, owners were almost unanimous in demanding more economy. Specifically, they want more miles per gallon out of their cars.

Detroit comment: "The trouble is that buyers want performance and power accessories—both of which take fuel. But we're working hard on economy. Actually, our record looks good when you measure specific fuel consumption per horsepower-hour. And it looks good in gallons per ton-mile. We've been improving."

New power plants. Question: What's the first thing that comes to your mind that would make tomorrow's cars superior to today's models? A large number of voters anticipated that the familiar old up-and-down piston engine is due to be replaced with something simpler and more efficient. The types most commonly mentioned were the gas-turbine and free-piston engines.

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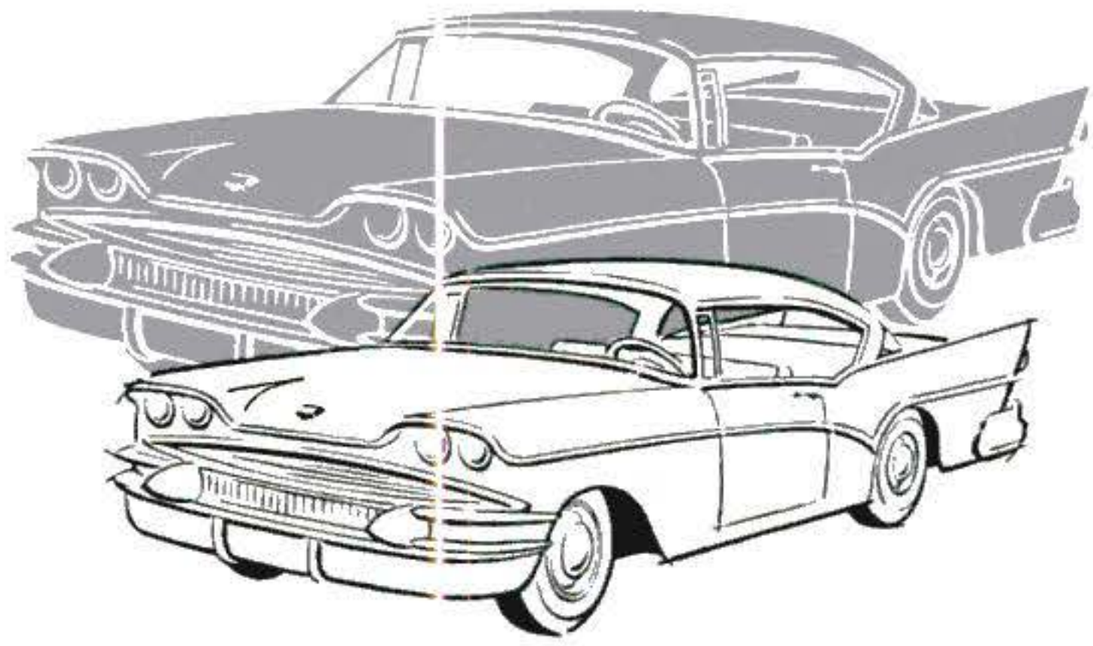
Detroit comment: "Both these jobs burn cheap fuel, it's true, and they probably won't be difficult to service. At the moment, though, there appears to be a hitch with the free-piston engine—its weight may restrict it to tractors, bulldozers and construction machinery.

"The gas turbine is definitely in the works, for 1965 or later. But first we have to get its manufacturing costs and rate of fuel consumption under control."

Improved servicing. A very common demand of those polled was for easier servicing and less of it. A number of owners sounded off about the jam-up of repair jobs at their dealer's service shop. Even more complained about the quality of assembly and inspection on brand-new cars; they wanted their new babies to have had a really thorough going-over before delivery.



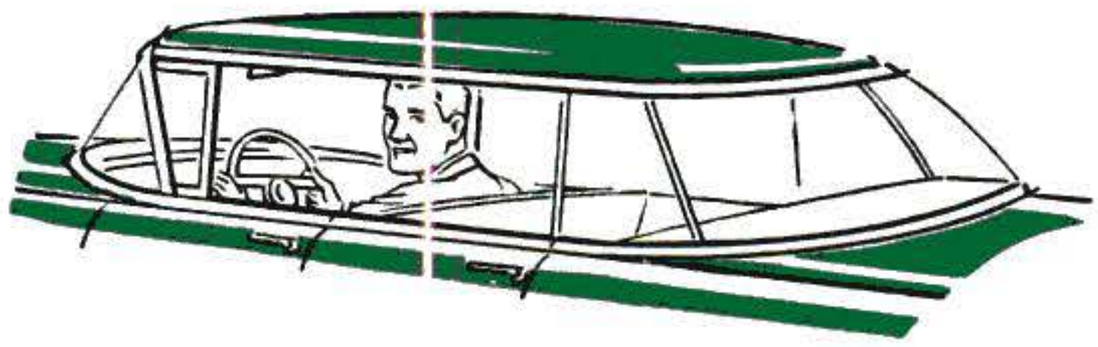
An astonishing 38 percent of the drivers polled voted for smaller automobiles. More than half—58 percent—said, "Don't make them any bigger."

Detroit comment: "This too is basically a cost problem. The time required to do a watertight inspection job would equal the total labor time for building the car to begin with. The warranty system is intended to correct any factory slip-ups. New owners would do themselves a favor if they gave their cars a check before the warranty runs out.

"As for service accessibility, it's a toughie. The OHV V-8 is just naturally tight between the wheel wells, and when you add on a number of auxiliary systems, things can't help being crowded. But every manufacturer has teams of engineers that work on accessibility all the time. You'll note that things do get better: Plugs and oil filters are easier to get at in the 1958s than they were a couple of years ago."

Safety isn't first. To the question of the greatest single future improvement, those polled gave a third-place vote to improved design for safety. Unitized bodies, re-engineered steering wheels, and injury-prevention features in the passenger compartment were most often mentioned.

Detroit comment: "We think the entire industry will have switched over to unitized construction by 1963, though not wholly for safety reasons. Today's deep-seated steering wheel is the safest we have ever had. The driver is now substantially safer than a rider sitting next to him."



Over 50 percent were satisfied with current design on windshields and windows. But one-quarter wanted more glass

Gadgets for safety. A small but articulate minority of drivers reporting felt strongly about the need for some compulsory safety mechanisms. Among the favorites were more-audible turn-signal blinkers, photoelectric headlight dimmers, speed-warning signals, and speed-limiting governors.

Detroit comment: "You'll get the more-audible blinker on turn signals—we've needed it. A flock of this year's cars have some form of speed reminders. As for photoelectric dimmers and speed governors, they're available now as accessories, of course. There certainly doesn't seem to be either economic or legal justification for making them compulsory."

Big cars or little ones? The PS poll gave drivers a chance to vote on body design. It asked how they felt about the size, height, trim and glass area on the cars they would

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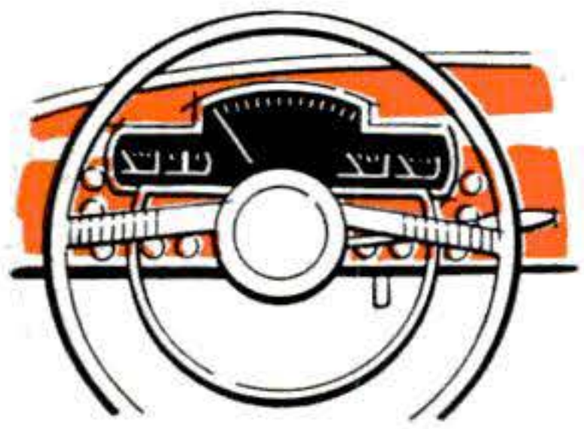
"People don't always buy what they say they like. Our

like to buy next time. When the results were tabulated:

An astonishing 38 percent voted for smaller automobiles. More than half—58 percent—said, "Don't make them any bigger." Only a trifling four percent were willing for cars to get still bigger.

Detroit comment: "People don't always buy what they say they like. They claim they want a middle-of-the-road design, even a conservative model. Well, our company once believed them—and nearly lost its shirt."

A similar pattern in voting showed up on other dimensions of tomorrow's ideal cars:



"Why can't we get rid of those idiot warning lights? Bring back the gauges, and group all the controls close to the driver."

Preferred height: Almost 15 percent wanted cars that are lower than today's. Sixty percent were happy with the present height. And 25 percent wanted them higher.

Luggage space: One-quarter wanted more. Over half were satisfied with the trunks they have. Around 10 percent could do with less.

How about the glitter of glass and chrome? Car owners have strong feelings on both.

Chrome and trim: Exactly half wanted less chrome on future cars. Not far from that number would settle for today's chrome and trim. And a lonely seven percent wanted more metallic icing.

Detroit comment: "Here again they ask for what they won't buy. As part of our line, we make a plain-Jane car, almost stripped of chrome and trim. We sell only 16 percent of our capacity for making that car."

Window area: Over half were satisfied with the current designs on windshields and windows. One-quarter wanted more glass area. The rest wanted less.

Detroit comment: "Those who want more will be happy to know they will get it in a few years. Many drivers squawk that the A-posts on each side of the windshield block their vision. So we are going to try to lengthen the wraparounds."

Two out of three people prefer a car designed for suburban use—for trips to the shopping center, visiting friends

Inside, what improvements do you want next, PS asked the public?

Seating: Car owners reported three main desires. (1) A separate, more adjustable seat for the driver; (2) flooring that doesn't have that hump in it; (3) more leg room in back.

Detroit comment: "Building a separate, independently adjustable seat for the driver would probably mean tying a fat price tag on it. Sure it'd be a convenience—but how much is a convenience worth?

"The hump on the floor is a serious problem. It's more than just a hump: It's a big hump up front, another one that's not quite so big in the rear, and a frequent restriction on seat springing in the middle of both front and rear. (You'd be amazed, incidentally, at the amount of engineering money that's been spent in keeping the problem from being no worse than it is.) Our feeling is that there are only two 'clean' solutions: We'd need either a radically different transmission,

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or a change in our engine-in-front, drive-in-rear thinking.

"As for more rear leg room, everybody's working on that, too. It isn't quite as simple as it looks. For instance, we figure that each additional inch of length is likely to cost you about $50 more."

Doors, locks, instruments. Autoists like the new flush exterior handles so well that they want them inside, too. Door-locking mechanisms that freeze up are a special abomination. And replacement of the ammeter and oil-pressure gauge with warning lights still annoys mechanically minded drivers. Said one:

"Why can't we get rid of those idiot warning lights and bring back the quantitative indicators? An intelligent driver needs to know *degree* of charge or pressure—not just a foolish all-or-nothing signal. And why do they keep putting radio controls, ash trays, glove compartments, and all the rest so far away from the driver?"

Detroit comment: "Flush handles inside doors would exact a penalty of thicker, heavier doors, and less interior width. As for warning lights, there's a genuine issue here, apart from any cost saving. We feel that a suddenly appearing, *new* signal on the panel is far more likely to be noticed by the general run of drivers than just a different position of a familiar pointer.

"Convenient location of controls is a continuing headache. For one thing, we are trying to jam too many gadgets into too little space. Now we are seriously talking about adding a wastebasket because police departments lately are getting tough about anti-litter laws."

What owners want in the car of the future

- More miles per gallon. Poor gas economy was the commonest gripe.
- Easier—and consequently cheaper—servicing and repair.
- A thorough going-over for each new car before delivery, to get the "bugs" out and avoid unnecessary trips to the dealer.
- A slightly smaller car with less—though more tastefully designed—chrome trim.
- A car designed for suburban use, for shopping and visiting, easy to park. Long-haul, high-speed usage was rated secondary.
- A safer and more comfortable driver's seat.
- A roomier interior, easier to enter and leave.

Underlying all the improvements and gadgets that drivers wanted, there is one clear motivation. An American motorist is as practical as a five-dollar bill. And he wants his car to be practical, too—designed, built and sold to be driven.

So PS asked what kind of driving do you think cars should be designed for? We asked owners whether they wanted a car for suburban travel—trips to the shopping center, visits to friends—or for heavy-duty driving on turnpikes.

Two out of three people felt that a suburban car was best for them. The other third preferred a long-haul road car.

How about that second car?

A standard American car is the choice of less than half of those who want to fill the other half of their garages. But, together, small foreign cars and station wagons won out over standard models. They got well over half the votes. The breakdown: Thirty percent of the drivers felt they would buy a small foreign model as a Number 2 car. Around 28 percent would put their money down on a station wagon.

Anyway, that's what motorists are saying. Detroit may disagree—but is listening hard.—*Charles M. Garvey.*

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Getting the Most

Practical pointers you may not find in the manual—on the care and feeding of your new car

By William Carroll

TELEPHONE equipment burned as the unhappy owner's shouts leaped 12 inches from the receiver to the Service Manager's ear. "I come back to find my car sprawled on its axles in the garage. What kind of a contraption is air suspension, anyhow?"

Across the desk from another manager sat a prim lady, old-fashioned flowers in her hat contrasting with the fire in her eyes. "Young man, it's a shame the way your company tried to take advantage of me. When my nephew went to put air in the tires, he found you gave me no spare tire. I want my tire, right now."

Certainly it's no secret that new cars stir new questions. Of course air-suspension systems may "leak down" in a couple of weeks. Start the engine, wait a few moments and the body will rise to normal height. Chrysler and De Soto nine-passenger wagons carry no spare tire on purpose. Instead they use Captive-Air tires that, even if punctured, retain air for several hours.

Here are commonly misunderstood facts about—and preliminary service experience on—the 1958 cars. It's information from the people who know: owners dealers and factory service managers.

BUICK Don't use the Grade Retard position on the Flight Pitch Dynaflow above 45 m.p.h.—it's not necessary and is hard on the seals in the transmission. Unlike last year, when the heat gauges usually banged the "Hot" mark after a few minutes of idling, the '58 engines normally idle cooler. The lift control on Air-Poise cars can be operated while driving at a slow speed, but don't ride more than a short distance pumped up high. Massive-appearing bumpers might bend unless you use jack pads in front or bumper notches inboard of the tail lights. Fender scratchers may appreciate spray cans of color-matched touch-up paint found in Buick parts departments.

CADILLAC Give headlight-dimming Autronic Eye time to warm up, and keep the windshield clean, before hurrying to the dealer with a "faulty" unit. In owner's manuals, but often unread, is the request that you *not* use detergents, bleaches or solvents on a convertible top. Reason: Threads used to stitch the fabric may retain chemicals, weaken and let the top split. Art gum will remove most soil spots. Finish cleaning with luke-warm water and mild suds.

CHEVROLET Tinkerers with the petcock on the air-suspension junction block may lock the system, resulting in a rough ride. Chevrolet didn't goof by putting two windshield-washer bottles on air-suspen-

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from Your 1958 Car

sion cars. The extra bottle holds anti-icing alcohol for the air compressor; keep water out of it. Special jack with air jobs lifts entire end of the car. Dealers can wire electrical accessories either to bypass or be controlled by the ignition switch, which no longer permits removal of the key when the ignition is off but not locked. Higher pressure in the radiator, 13 p.s.i. versus seven p.s.i. in '57, calls for caution in checking coolant.

CHRYSLER Nothing is wrong with the optional Auto-Pilot if it seems to hold the accelerator pedal down. Unlike other speed controls, this one eliminates the need for keeping a foot constantly on the accelerator. The air conditioner in a friend's Chrysler may be different from yours. There are three types: a standard unit, mostly under the hood; a dual one with a second evaporator in the trunk for increased capacity; and a dealer-installed hang-on unit that can be fitted under the instrument panel.

DE SOTO Power-steering units that turn with a touch are not plotting to steal control of your De Soto. All Chrysler-built assists require only four pounds of your effort on the steering wheel to pass another car at 30 miles an hour—versus 21 pounds for manual steering. Service-station attendants should not be asked to lubricate rubber liners between longer rear springs. Liners control friction, do not eliminate it. Your De Soto dealer may not know it, but there *are* optional engine packages of special carburetion, dual exhaust and hot camshaft.

DODGE Hi-Temp brake fluid in Dodge (and all Chrysler-built cars) should not be topped with other types. No need to worry about power-brake failure. Should power assist fail, braking effort is applied directly through the regular hydraulic system. Headlights are not poorly adjusted if low beam spills to right of road more than your '57. Dual-lamp sets are aimed that way on purpose.

EDSEL Mislabeled front springs caused a few early Edsels to squeak like mice. If yours does, ask a dealer to insert factory-supplied shims that solve the problem. Some owners found the horn relay upside down, in which position it collected instead of shed rain water. If full of water it may burn out, so check yours—terminals should be at the bottom. Teletouch transmissions have caused little trouble, but the relay in the pushbutton circuit of the first few thousand cars failed prematurely. At first sign of transmission's refusal to count its buttons, head for an

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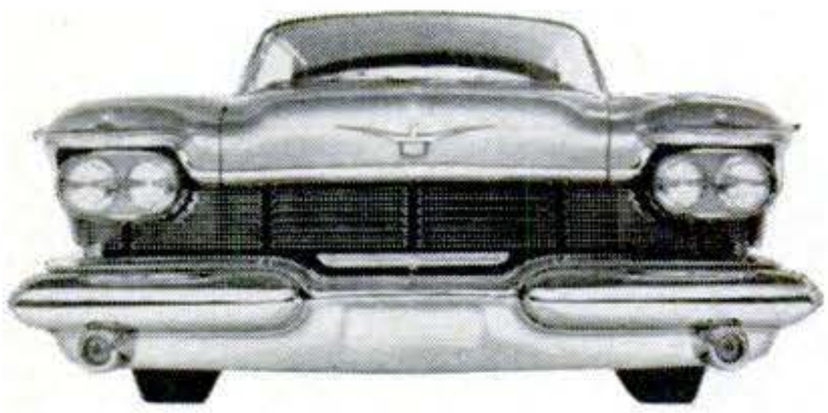
New features present new problems . . . Here's what

Edsel dealer. Reports of oil burning proved to be based on leakage around distributor shaft; the factory supplies a sealing ring at no charge.

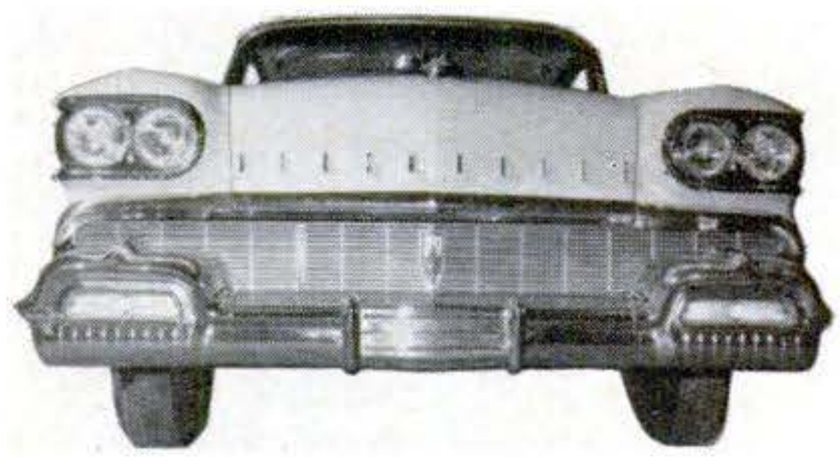
FORD Cruise-O-Matic transmission has three forward range settings. In "L" it stays in low and will not upshift. "D-1" starts in low, shifts through second to direct; while "D-2" starts in second and shifts to direct. Go easy on using abrasive-type polishes on the new harder-enamel Ford finishes. Abrasives will scratch and dull the surface instead of making it glossy. Use regular gas for all Ford engines except the 352-cubic-inch V-8, which requires premium fuel.



IMPERIAL New owners shouldn't call a plumber if windshield washers shoot four streams of water instead of two. The extra squirts are part of the Imperial scheme to have more than anyone else. Optional dash-mounted door switch both locks and unlocks the doors. Pressures for optional 11.00 x 14 Super Soft Cushion tires, largest ever offered on production cars, are 17 pounds front, 14 pounds rear.

LINCOLN A cross-country driver complained that service stations refused to lubricate his 1958 Lincoln because they couldn't decide where to lift the new unit body. It should have been no problem: There are corrugated lift pads under the car body. Change oil-filter cartridge and fuel-pump filter every 4,000 miles. Dry-type carburetor air cleaner is cleaned every 2,000 miles if necessary, and replaced at 20,000.

MERCURY Two warning lights on the Mercury dash are unlike those of most cars. Power-lubrication warning bulb shines only when you're running out of fluid. Bulb on air-suspension cars glows to warn of low air pressure, goes out when engine is allowed to idle. No one should be able to sell you a new belt for the power-steering pump; it's driven directly by the crankshaft. Nor a brake adjustment. Brakes set themselves when applied as car is backing. Never change Pow-R-Transfer rear-axle lubricant, which should be topped only with special factory oils. "Hill Control" on Multi-Drive transmissions is disguised low gear, can be used for maximum power where upshift is not desired.



OLDSMOBILE Tire-changing a '58 Olds with air suspension will confuse air regulators trying to keep the car level unless you use the override control to raise car to maximum height. Many new owners are uneasy about the action of power brakes if the engine should die. No reason for worry: The vacuum reserve is good for four to seven power-assisted applications.

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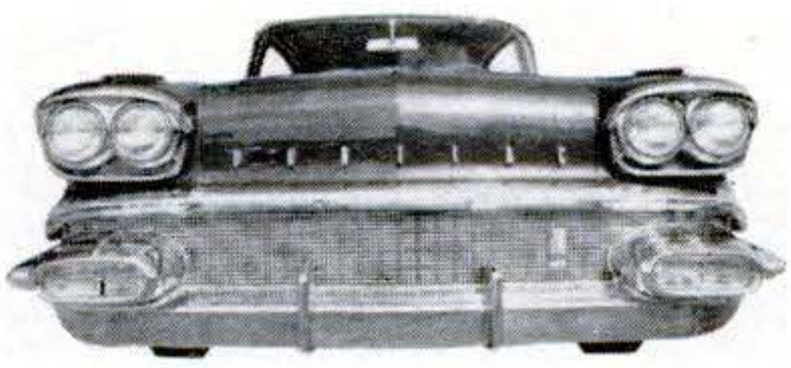
owners and mechanics are learning about the '58s

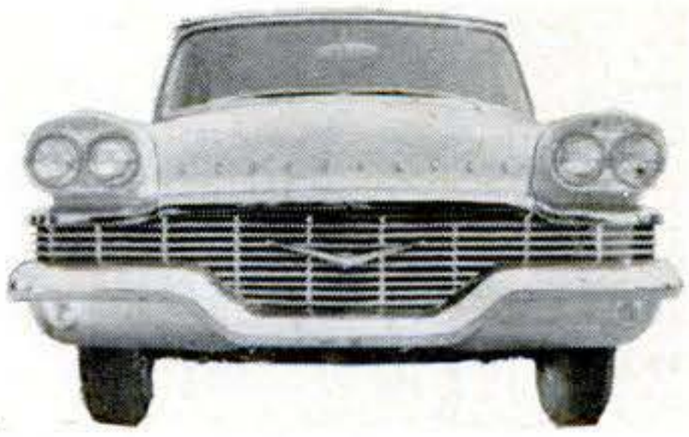
PACKARD Horn pitch can be customized by rotating a tone-adjustment screw on top of the horn housing. Supercharged Hawk engine has a two-throat carburetor to maintain fuel economy until blower cuts in with blast of power. Nothing is missing if exhaust-pipe brackets no longer tie the pipes to a transmission stud. Engineers left brackets off on purpose to minimize noise transfer.

PLYMOUTH Electronic fuel injection should not be taken to nearest TV shop for repair. Plymouth dealers can replace troublesome components on an exchange basis. There are three distributors and three cams matched to various power options; thoughtless mixing may reduce performance rather than improve it. Regular gas is suitable for all engines except the Golden Commando. But no penny-pinching on oil quality: New engines are set up to use "MS" quality oil. Change oil and filter at 5,000-mile intervals.



PONTIAC On air-conditioned cars, have the system checked annually by a dealer; he'll blow bugs from the condenser and radiator core, flush and clean the evaporator housing, and bring the refrigerant charge up to specifications. Premium fuel is required for all Pontiac engines except those with 8.6:1 compression ratio. The porous paper fuel filter at the carburetor should be changed every 15,000 miles; oil changed at 2,000 to 4,000 miles. In "Performance DR" the engine brakes through third gear. "Lo" braking is through second gear, too potent for use at high speeds.

RAMBLER Your new Rambler has not been wrecked and repaired if primer shows under panels that were usually unpainted bare metal. A dip process now dunks the entire body in rustproofing primer. Use regular gasoline in either the six or the V-8. That lever near your left foot does not operate windshield washers, but is a new step-on parking brake.



STUDEBAKER No reason to fret if a Studebaker leans a bit under only the driver's weight. Perhaps the front hanger bolt of the rear spring is in the wrong hole. The standard left-hand-drive cars use the lower hole on left bracket, and upper hole on the right. But the special right-hand-drive cars for the export trade have the bolt pattern reversed. Universal joints on new one-piece drive shaft have no lubrication fittings and should be disassembled, cleaned and repacked at 20,000-mile intervals. END

NEXT MONTH: You'll never be caught with a dead battery, or the wrong one for your car, if you read "How to Buy a Battery" in February PS.

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How Safe Are the 1958 Cars?

They show solid progress toward safer design—but see for yourself why we're still a long way from a crashproof car

By Paul W. Kearney

DESPITE some dragging of feet, it is evident from the 1958 models that safety is getting increasingly serious attention in Detroit. This is encouraging. For the real shame of our automotive age is not so much that we have so many fatal accidents, but that we have so many *survivable* accidents in which people are killed.

It is becoming clear that your chance to survive an accident has taken a sharp turn for the better as a result of the recent Design Reformation. Thanks to the brothers Ford, who nailed the proclamation on the cathedral door, injury prevention through improved design suddenly became acceptable. The motoring public got interested enough to want to hear more. Consequently, even those auto men who privately disparage the safety belt—and there are such—don't dare not offer it. And the last of the chest-crushing steering wheels with a protruding hub, on American Motors' Ramblers, has surrendered to the dished type.

Is the furore paying off? Definitely yes. At last August's Congressional hearings, a bale of convincing evidence was presented by John O. Moore, in charge of Cornell's automotive crash-injury-research program. Cornell studies had previously revealed only slight variation in injury patterns in cars made between 1940 and 1955—but marked changes are now showing up in accidents involving 1957 and late '56 models.

From a study of 10,000 accidents affecting 24,000 persons, Cornell crash-injury researchers report these significant highlights:

- 60 percent injury reduction in cars with seat belts, over comparable no-belt accidents.
- 50 percent fewer steering-wheel injuries, due to deep-dish design.
- 30 percent reduction in hurl-out injuries thanks to impact-resistant door latches.
- 30 percent drop in dashboard injuries—through crash padding.

On the basis of two million injuries annually, this really adds up. Moore estimates that 5,000 lives a year can be saved simply by keeping people from being hurled out of cars—using either seat belts or safety door latches. And these lives can be saved even if you figure on no reduction in the *number* of crack-ups.

That the car buyer is interested in safety is clear from Ford's report that 43 percent of all their 1956 cars were ordered with the crash-padding option. Likewise, enough seat belts were bought in the first year of factory-sponsored sale to safeguard over 330,000 riders—if they fastened them.

Notable new accomplishments in safety are with us, nonetheless. Among the more general ones are greatly improved rear-end illumination, the increasing trend to higher fresh-air intakes, and the adoption of dual headlights as standard equipment. There's also the steady advance of the front-hinged hood, even greater driving vision than in '57, and the increasing use of speed-monitoring systems.

Some equally interesting innovations

DURING THE PAST 2½ YEARS, crash tests like this one, staged at Ford's engineering and research center in Dearborn, Mich., have contributed substantially to the development of safety features offered in the 1958 cars. The impact suffered by dummies like the one in the picture at left is measured by electronic devices in a truck wired to the test cars.

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in specific lines include the following:

- Edsel's prize arrangement of the pushbutton transmission controls in the steering-wheel hub, where they belong; its signals for low fuel and oil levels; and its single-dial control for heater, defroster and ventilators.
- Chevrolet's adoption of the electric windshield wiper, heretofore a Chrysler exclusive.
- The self-adjusting brakes on Mercury and Edsel.
- Dodge's tinted-plastic sun visor (long used by Nash), and the unique Polaroid visor on Lincoln and Continental.
- Chrysler's rear-window defroster, and its four-stream windshield washer.
- Oldsmobile's elimination of the horn ring, always a potential stiletto.
- Remote-control outside mirror featured by Cadillac, Mercury and Chrysler. And the latter's repositioning of the *inside* rear-view mirror throughout the entire line is a great improvement over 1957. Since it's closer to the driver, he has a much wider angle of view; since it's off-center, passengers don't block that view.

All these items combined do not add up to the Cornell-Liberty Mutual Safety Car [PS, December], with its levers replacing the steering wheel; its bucket seats with the driver in the center and most passengers facing the rear; its restraining yoke for front-seat riders, and other radical concepts. Even so, this year's advances will pay dividends in greater security—and in '59 and '60 will doubtless find their way to other cars.

Experience on the turnpikes—where a new accident pattern has been set—led directly to three of these new developments. Since we stand on the threshold of a grand new Expressway Era—with 41,000 miles of superhighways in the offing—the three developments are news.

The first of these is the remote-control outside mirror. Most inside rear-view mirrors have failed to keep pace with the scope of wraparound rear windows. So a quickly adjustable outside mirror is no mere luxury.

The second by-product of the pikes is the speed-warning signal. Smoother roads and smoother cars are sucking many a weekend driver into speeds away over his head. Hence the ability to set a predetermined speed, and get a warning signal if you pass it, is a useful safeguard. The speed alarm has none of the serious drawbacks of the governor.

Buick's original "speed minder" sounded a rasping, intermittent note at the preset speed; Mercury's rings a bell; Edsel's lights up the whole speedometer in red; and Oldsmobile trumps these by lighting a light *and* sounding a buzzer.

Fanciest of the lot, though, is the Auto Pilot available on Imperial and the Chryslers. With this device, whenever you go over a preset speed, the gas pedal will press gently but firmly against your foot. This resistance merely tells you that you're going faster than you said you wanted to. If you did it knowingly—to pass another car, for instance—you just tramp on the pedal and complete the pass without hindrance. To disconnect, you simply touch the brake pedal lightly.

Another feature of the Auto Pilot is likely to evoke more argument: You can set the accelerator for a given speed, take your foot off the gas, and the car will maintain that speed up hill and down dale. Unquestionably, this could be a welcome relief to a cramped leg on a long driving day. But could it not also be hazardous? Piloting a car has already become too simple for the unwary, as proved by turnpike experience with drowsiness and hypnosis.

Another advance dictated by modern sustained-speed driving, shows up on the

Here are some safety features we still need badly

- An anti-hypnosis device, possibly operating off the car clock, that would sound a stimulating signal at intervals of about 15 minutes. The No. 1 accident cause on all turnpikes is Driver Asleep. Hence our greatest single need in this day of super-smooth operation is something to keep the man at the wheel alert and generally on the job.
- Some practical adaptation of the periscope principle to eliminate all rear-view blind spots and provide adequate depth of vision. Lower silhouettes and sloping rear roof lines have cut the straight-back view in some cars to a scant 100 feet.

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ejection with seat belts or safety door latches"

Edsel dash. Warning signals here light up when you are low on gas or oil. With some 500 cars a month running out of gas on the short New Jersey Turnpike alone, the need is clearly there. Yet wouldn't it be better to make such lights flashing, not steady; yellow, not red, for greater eye attraction? And with gas stations as far as 65 miles apart on the New York Thruway, waiting for the signal that you're down to four gallons can be cutting it pretty thin. In any case: When will we get another useful signal—long sold to truckers—that notifies you when your brake fluid begins to run low?

The third evolution from turnpike experience is the marked increase in rear-end illumination. From De Soto's carry-over of its '57 battery of lights on the rear fenders to Ford's new dual tail lights in a horizontal arrangement, the modern automobile's backside is really coming into full flower. These things may be entirely stylists' whimsies. But one of the most emphatic lessons to come from the turnpikes is the inordinate proportion of rear-end collisions, accounting for over 50 percent of the fatalities on our busiest superhighways. On this score, Minnesota Mining's reflectorized tape is still a very useful safety item, formalized last year by Mercury's reflectorized rear-bumper treatment. Dodge's "chandelier" effect and Edsel's sweeping gull-wing tail lights are steps in the right direction.

The five-year record of U.S. progress in safety design, by and large, has been amazing. (If you want to see how much, take a look at a '58 British-made Vauxhall and see how far we've come from that array of bone-breakers in the cockpit.) Nevertheless, the philosophy of Safety in Design is not yet as inherent to Detroit as the older doctrine of Safety in Performance. Take General Motors:

GM's swing to air suspension through the entire line is a good example of the desire for improved safety in handling. Yet while Oldsmobile has a good "deep-dish" steering wheel, improved further by the use of horn buttons in the spokes instead of a ring, Buick strays from this sound principle of the depressed design. It carries the two spokes clear across the wheel hub in an axe edge that will be very hard on ribs. The basic idea of the deep-dish wheel is nullified.

Pontiac has good padding on the upper back of the front seat, as does the Buick Special. But in the Buick Limited, this common impact area for back-seat riders is a real nose-breaker, reinforced by a bright metal strip that can benefit nobody but the plastic surgeons.

On the instrument panel, the more money you pay, the more razzle-dazzle you get. Thus, the Buick Special is comfortably subdued; but on a sunny day in the Century, Limited and Super, the highly polished surfaces are frightful to contemplate. Much the same can be said for the Pontiac and Oldsmobile panels—the latter a notable triumph of the Coney Island school of design. Compared with Lincoln and Continental, even the Cad-

[*Continued on page 258*]

NEXT MONTH: How does a car maker keep tabs on his competitors? In the auto industry's sheet-metal jungle, where billion-dollar sales may ride on the shape of a tail fin or a new suspension, all the big manufacturers use secret agents to ferret out each other's plans. Read the amazing story of Detroit's bustling espionage ring: "How the Auto Makers Spy on Each Other" . . . in February Popular Science

- Headrests, as in racing cars, at least in front seats. The excessive incidence of rear-end collisions on expressways has made the "whip-lash" neck injury a graver danger than ever.
- Higher fresh-air intakes. While they are rising above previous levels, none yet compares to the roof-level ports of Mercury's Turnpike Cruiser.
- Adequate and complete crash padding. It should be made mandatory, as safety glass is. And the padding should include the back of the front seat.
- Still better wiper coverage. Although it has been improved—notably in Mercury and Chrysler—vision in snow or driving rain can still be abominable through those curved "picture windows."

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How Good Is Russia's

Most Western reporters in Russia concern themselves with the Big Picture: politics, strategy, the stability of the government. Little has been told, in this age of Sputnik and intercontinental missiles, about the everyday technology of that enigmatic land—the TV sets, automobiles, radios, tools, household appliances. To bring you this fresh, firsthand report on how Russia compares with the rest of the world, POPULAR SCIENCE *sent Senior Editor Harry Walton on an automobile tour of the USSR. He drove close to 4,000 miles, visited a dozen Russian cities, rode the subway and trolleys, talked to hundreds of Russian citizens, shopped in department and hardware stores, studied every machine and gadget he could find. Walton, one of PS's star reporters, is well qualified for this assignment, with a background in auto engineering, machining, electronics, and appliance design. His exclusive report continues next month.*

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Everyday Technology?

Does Sputnik mean the Russians are ahead of us in other fields too? Here's what an alert visitor learned about their everyday products

By Harry Walton

HOW much of the brilliant technical skill that Russia showed in launching its earth satellites has been put to work for its own people? Do they have many of the mass-produced appliances that make life easier for us? What are their everyday tools and machinery like? Bringing back firsthand answers to these questions was one of my assignments on a three-week auto trip through the USSR.

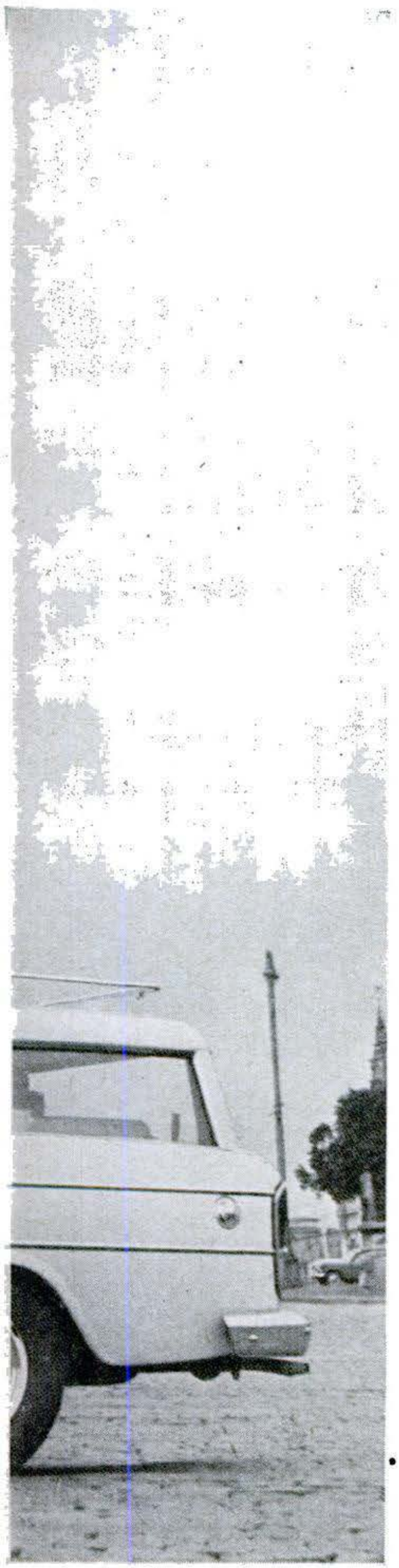
I talked to Russians in cities from Brest to Yalta. I was in Zaporozhe when Sputnik gave the free world a kick in its complacency (the first Russian reactions expressed to me were beaming pride, but no crowing). In jam-packed state stores everywhere I watched Russians jostle each other to buy such things as vacuum cleaners, TV sets, toys and electric kettles.

Few of the things I studied would sell in competition with ours. Many had the shabby look of rummage-sale goods; some were downright crude. Soviet manufacture is a curious blend of competence and carelessness. It shows little originality as yet; many items appear to be hasty copies of our own or German designs. But the meaningful thing, I was convinced, is not that Soviet tools or typewriters are poorer than ours; it's that they are in the shops at all.

"*Overtake America*" is a slogan blazoned from posters and road signs everywhere. This drive has gone beyond propaganda; the Russian people have bought it as their hope for the good things of life. "If there is no war," I was told repeatedly, "our system will outproduce yours in 15 years."

I left Russia convinced that we would be wrong to shrug off this boast. It is wishful thinking on our part to picture the Communist world as a backward culture straining a handful of skilled scientists to push through its ICBM and satellite programs. Instead, the Soviets have a tightly planned, enormously accelerated technology that is crowding hard on our heels. Ivan the peasant has already swapped his pitchfork for a turret lathe. Tomorrow he may run an automation keyboard from which he will control 16 machine tools instead of one.

Late starter though he is, Ivan—I learned in one lesson—is no slouch as a mechanic. The hose attachment for a jerry can I carried wouldn't clamp on. A good-natured Russian garageman diagnosed the trouble at once: The special, odd-



U. S. WAGON IN RED SQUARE: This Rambler station wagon, seen against the Kremlin, fascinated Russians wherever it went. Its six-cylinder engine had to be "detuned" to run on low-octane gas.

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shaped gasket in the cap was too thick. It raised the clamping lugs too high to slide under the locking clips.

"Could you bend up the clips a bit, or file a little off the lugs?" I asked.

He shook his head. *"Nyet, gospodin,"* he said and trotted off. When he came back he handed me the hose attachment and pointed inside the cap. There, neatly cut from thinner material to a perfect fit, was a specially tailored gasket. Bending, filing or other cobbling plainly shocked him.

Paradoxical contrasts often strike a visitor to the Soviet Union. The telephones are handsome instruments Western Electric wouldn't be ashamed of, and yet light switches often work only the third time around, and when jiggled at that. I was impressed by the fine main highways, the network of high-tension lines, the heavy machine tools on display in Moscow. But the plumbing is uncertain and convulsive, when it works at all, and such simple things as locks, latches and building hardware are often erratic or poorly made.

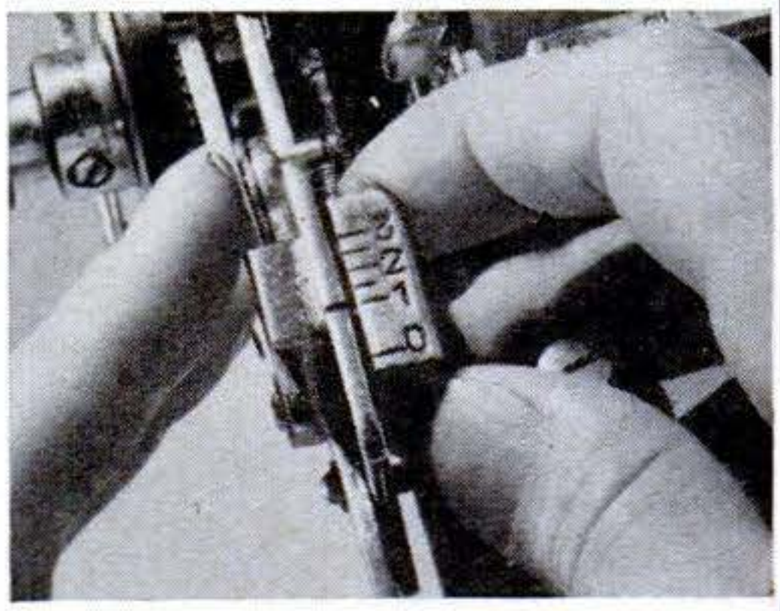
There need be no mystery about these shortcomings. Soviet planners put first things first (Sputniks, for example), and there is no private enterprise to jump in at the sight of a possible market.

After decades of consumer shortages the Russians are plainly goods-hungry. Every store I visited in a dozen cities was packed with shoppers. The things they can buy are, by our standards, limited in kind and quality. Often the stores are sold out of popular items; there are supposed to be four sizes of refrigerators, for example. I saw none. But by Russian standards, things have never been better. Whenever before could Boris buy himself an electric shaver? Today he has a choice of two, a straight-cutting type for 134 rubles, a twin-head rotary for 210 rubles.

Prices are high even at the special tourist rate of 10 rubles to the dollar. At the official rate of four to one they become exorbitant—that rotary shaver would cost $52. Perhaps the most realistic comparison is in terms of a worker's earnings. The average Soviet wage is less than 800 rubles a month, or about 30 rubles a day. So Boris works seven days for his electric shaver.

How can people pay such high prices? Goods have been unavailable for so long that many families have built up sizeable cash reserves (there are plenty of savings banks in the USSR). Since the Soviet economy is still one of scarcity, there is more cash than merchandise. This is the Communist form of inflation. It is perhaps one reason why the government last year froze (in effect, canceled) the lottery bonds in which workers had been compelled to put one month's wages a year.

When you go shopping in the USSR



SOVIET TYPEWRITER is sturdy, but dated in comparison with ours. It has front margin sets, a platen clutch, and a line spacer (above) adjustable in half-line steps. Type bars have poor temper, lack the spring-back of those in U. S. machines. Written sentence is our familiar "Now is the time" quotation in Russian.

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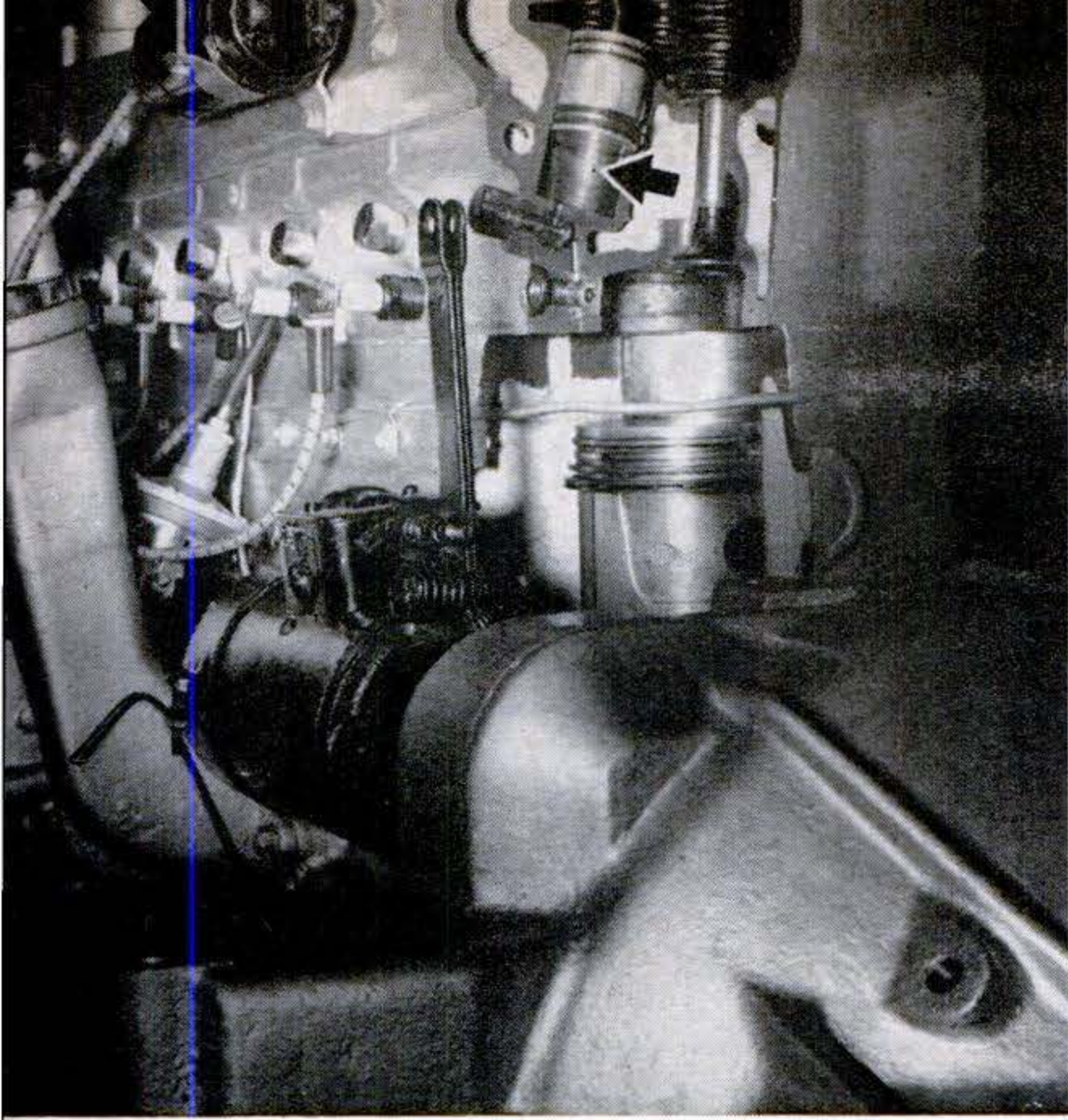

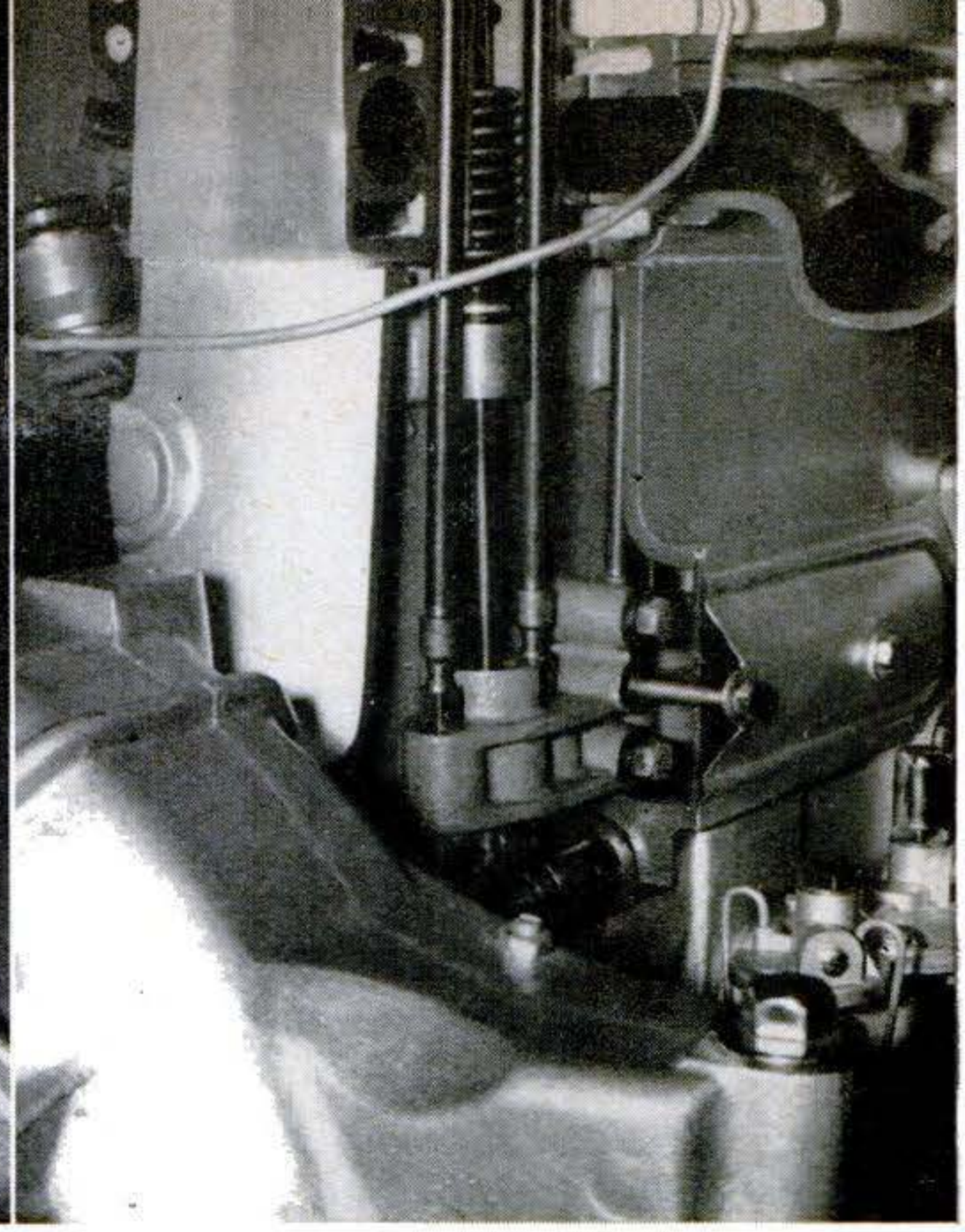

UNUSUAL RUSSIAN ENGINE is designed to run on a mixture so lean it cannot be fired by a spark. Carburetor delivers this mixture to the cylinder, a richer one to small cylinder (arrow). Piston driven from an extra lobe on camshaft (shown in photo at right) compresses richer charge, forces it past a valve into tiny firing chamber behind plug. Fired by spark, it jets into main cylinder, igniting lean mixture there. Russians say the engine uses 20 percent less fuel.

you instantly feel the difference between the Communist and free economies. There is no advertising, no competition, no price cutting, no discounting. Store managers can reduce an item only if it stubbornly refuses to sell, and then only with the permission of the Ministry of Trade. Nobody pressures you into buying an inferior article; the trouble is that you may not be able to find a better one.

I bought a carpenter's plane for 30 rubles—the only other one available was identical but smaller. Its sole plate is aluminum—soft and easily nicked. There is no cap iron to turn the shavings; the blade bevel is flat-ground; there is no fine adjustment for either depth of cut or blade alignment. But the edge is sharp and the plane, carefully set, will do its job—it's an adequate but primitive tool.

Shopping is no lark. I got my feet stepped on (and probably stepped on a few myself) before managing to get up to the sales counters. Once you've caught the attention of the harried salesgirl, she'll dig up what you ask for—assuming it's in stock—and put it out on the counter for you to examine (is it from fear of light-fingered comrades that most goods are warily locked up?).

Washing machines. In an appliance store I watched a pretty blonde demon-

Next Month: Exclusive color photos of Russia today

What are Russian cars like? And what kind of drivers are the Russians —in rush-hour Moscow traffic, or out on their surprising new high-speed intercity roads? What happens when, at 135 kilometers per hour, you encounter a cow with no tail light? Can an American soft-talk his way past a militiaman-cop whose motorcycle comes complete with burp gun? What happens when you take an American station wagon to a Russian Gus Wilson?

Next month, in words and exclusive color pictures, Harry Walton will take you on a high-speed, 3,500-mile run through post-Sputnik Russia. Don't miss the astonishing details of Russia seen through a U. S. windshield.

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EXPOSURE METER is well made, easy to use. It compares favorably with ours in accuracy and sensitivity, reads incident or reflected light, costs about $48 (at four-to-one rate).

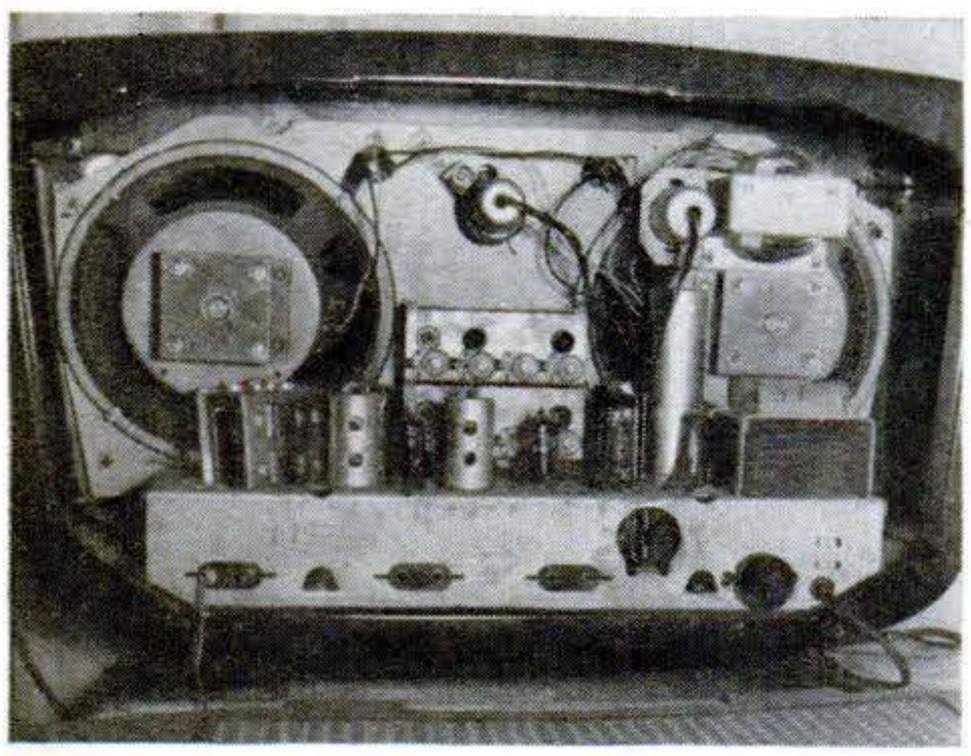
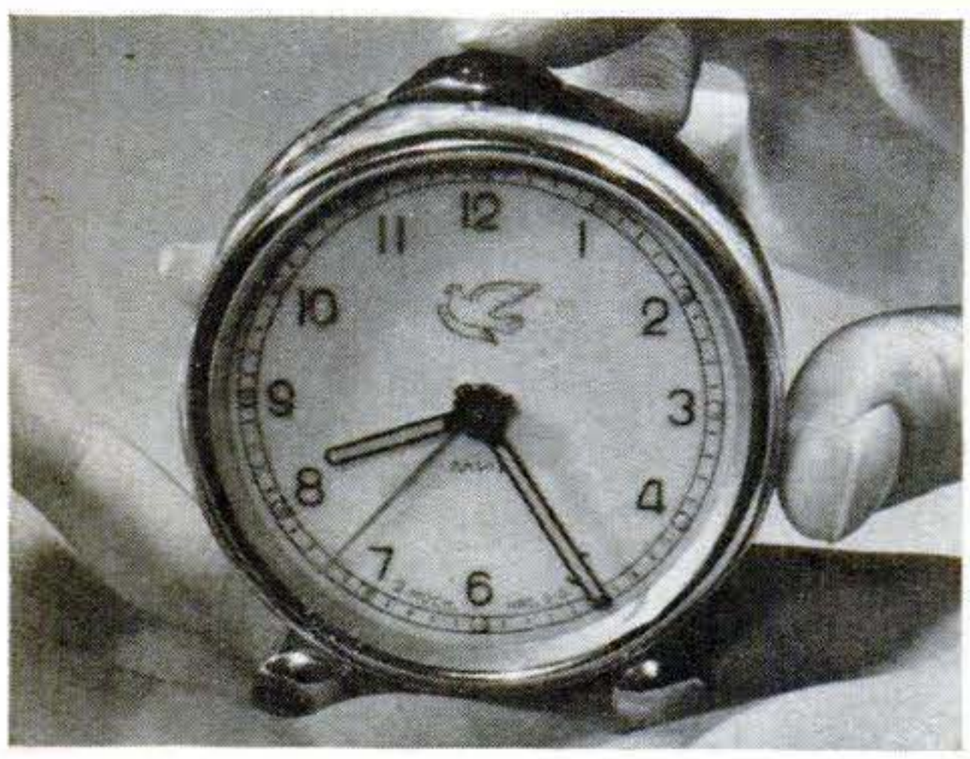


TABLE RADIO in a provincial hotel room looked like this in back. It is a four-band receiver with dual speakers, a tuning eye, good selectivity. Tuning is a bit tricky.



QUALITY ALARM CLOCK, brand-named "Peace" (note dove emblem), is a 36-hour spring-wound job. Accuracy and finish are both excellent. Price is equivalent to $19.

Here are things you can buy in

strate a Soviet washing machine to a housewife. It had a cylindrical tub about 1½ feet in diameter and 2½ feet high. Before the wide-eyed housewife, the salesgirl showed how the lid hinged back to make a splash tray for a hand-cranked wringer. Inside, a stamped, finned agitator tumbled the clothes at a leisurely pace. Its cleaning action was clearly less energetic than ours, and the three-pound clothes capacity was small. But the housewife was plainly interested despite the 750-ruble price. Later, in Kharkov, I saw a slightly bigger machine for 900 rubles. Nowhere could I find any with spin drying or automatic cycling; nor did I see any clothes dryers.

Television is beginning to boom in Russia. Moscow now has two stations and you see the antennas sprouting from grass-thatched cottages for miles around the city. Many other cities have at least one transmitter on part-time schedules.

A two-channel receiver with a small (eight-inch) picture tube sells for 800 rubles. Magnifying lenses are often sold with these sets. A three-channel set with a 12-inch screen comes to 1,900 rubles. If you shoot the works you can have a five-channel job with a 15-inch tube and a phono plug-in for 2,600 rubles—say $650, or more than three months of working days.

All these are table models, in plain but pleasing wooden cabinets. Picture quality seemed quite as good as that on my own 21-inch RCA at home. The transmitted image is scanned by 600 lines, of which the maximum received is about 450 lines (our standard is 525 lines, of which we may get as many as 480).

Radios are enormously popular too. (One reason might be that listeners have a choice of foreign as well as USSR programs.) I admired a portable in a handsome red plastic case at 340 rubles; it used either house current or batteries and had excellent pickup on its internal antenna. All my inquiries about transistor radios, however, drew a complete blank.

Home radios are sometimes elaborate. A well-styled table model with a six-band chassis and tuning eye was shown for 715 rubles. For 1,200 rubles you are welcome to an elaborate radio-phonograph in a high-grade furniture cabinet. The Russian preoccupation with tuning eyes may make

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sense; perhaps because of overlapping distant stations and good sensitivity, the sets I tried weren't simple to tune.

Phonographs come in all sizes. At the bottom of the heap I found a tricky little wind-up job with an acoustic reproducer, the whole works folding up to about the size of a book. Price: 100 rubles. Electric record players, with motor, pickup and amplifier, start at 350 rubles.

Records, incidentally, come in 78 and 33⅓ speeds. Long-play ones come in the equivalent of our 10-inch size. The unbreakable plastic ones are both inexpensive and well made, with a remarkably low noise level. The record shops are jumping with customers. While U.S. jazz tunes are frowned on by the authorities, the kids seem as well posted on them as if they listened to the Hit Parade.

Electric power in the USSR is supplied at 127 and 220 volts, 50 cycles. A Russian who shares his apartment with others—as most do—can buy an electric meter of his very own to measure his part of the bill. The meter, widely sold, costs him about 170 rubles; he will probably wire it in himself.

The wiring, by the way, would give Underwriters' Laboratories the fidgets. Sometimes it is exposed knob-and-tube, of a sort we haven't used for a generation. Other times it's a twisted pair strung casually along walls and ceilings on small stand-off insulators. Plugs, like those elsewhere in Europe, have round rather than flat prongs. Curious as to why hotel switches were often defective, I made a point of buying some new switches. They had generously big wipe contacts, promising long life, but the phosphor bronze seemed less lively than ours. One neat little plastic canopy switch had not only big wipe contacts and ample current rating for its size (2.5 amps at 220 volts) but also the refinement of tiny clamp-screw sockets for the wires instead of the pigtail leads common to ours. I suspect the capricious hotel switches simply reflect careless maintenance.

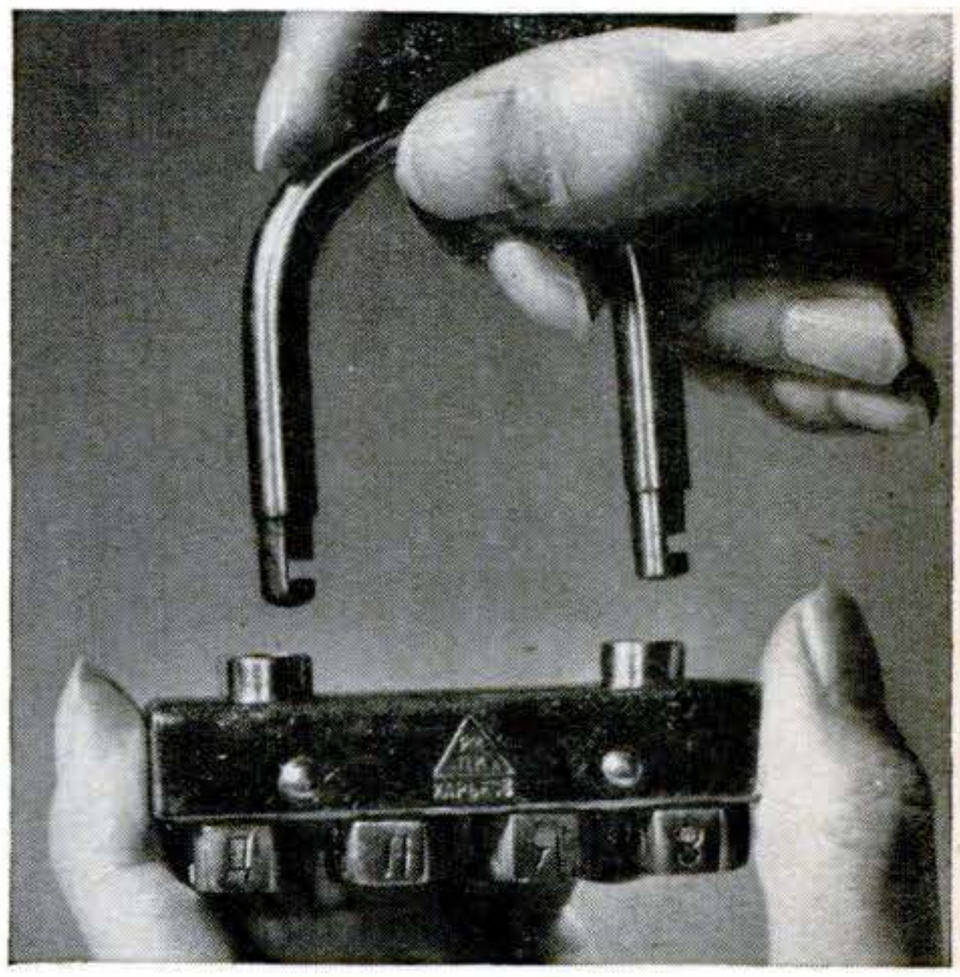
A rather small tank-type vacuum cleaner can be had for 400 rubles, and a more modern drum-type job comes to 650. An electric motor and foot rheostat to power a sewing machine was tagged at 177 rubles.

Although natural gas is piped to Mos-

[Continued on page 256]

CARPENTER'S TOOLS are crude. Aluminum-bodied plane at $7.50 has a primitive design. Chisel at $1.25 has rough handle and is poorly ground, with a dull edge.

STUDENT'S DRAFTING SET is of fair quality and cheap at $4.50. Knife and small screwdriver (right) are well made, have polished blades. The larger one (left) is rough.



COMBINATION PADLOCK releases when hexagonal buttons at the bottom are turned to four-letter code. The lock is ingenious but naive; it could be jimmied easily.

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Big Bombers Learn

STRAIGHT UP AND OVER streaks this B-47 on getaway after tossing its bomb. New technique brings the bomber in fast and low, hidden from radar, safe from supersonic jets and missiles.

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New Hit-and-Run Trick

Now our B-47s can fly like fighters—in over the treetops out of radar range . . . drop The Bomb . . . loop away safe from the blast

Only hours after Sputnik I first beeped through space, Soviet chief Khrushchev was telling an anxious world: "The Age of Bombers is over. They might as well put [them] in the museum.'

How premature was this dire verdict?

The answer to that question is crucially important to everyone in the free world; for if war came soon, Western retaliation would depend heavily on the U. S. Strategic Air Command's great fleet of more than 2,000 middle-aged medium bombers.

The B-47 is a magnificent machine but it first flew in 1947; it is not quite sonic; it is vulnerable to newer defense planes and to missiles. Yet it is an astonishingly versatile airplane.

The following article describes a brilliant new technical adaptation that may keep the B-47 out of the museum for years. Its author is a noted aviation expert whose reports often appear in POPULAR SCIENCE, *the Saturday Evening Post and other magazines. The first-hand experience he relates here left him doubting that the age of manned bombers is over—just yet.*

By Frank Harvey

THE B-47 jet bomber appeared low over the palmetto scrub on the test range at Eglin AFB, Florida, looking fragile as a dragonfly despite its 90 tons and six engines, moving very fast and pulling two long plumes of marker smoke. For a moment the near-sonic plane was soundless. Then a freight-train roar washed in and the bomber zoomed into a vertical climb—held it—and released its toss bomb. The bomb, trailing pink smoke to mark its flight path, resembled an incredibly long pink worm squirming upward into the blue.

Now the bomber started its getaway from a blast that would—in war—be big enough to wipe out a metropolis. The white bomber trail began to lean backward—away from the pink serpent—and the B-47 went over on its back in what looked like a loop. It wasn't. On top of the loop, the toy-size bomber rolled right-side-up, twisting its smoke trails like skeins of silk floss, and sped away in the haze.

The pink worm reached its apogee, curved back towards earth and squirmed down over its target—a concrete house about two miles away. A thousand feet over the house—optimum altitude for an H-bomb burst—the pink worm blew up like a firecracker.

"It looks simple enough," I said to Major Joe Moore, the toss-bombing expert who stood beside me on the range.

"It's simple as pie," Moore said. "Let's get back. Major Tinsley will be landing to take you up on a toss-bomb run."

Under the wing of the B-47, Major Marcus Tinsley looked disconcertingly young—yet he was a veteran of two wars, had flown experimental jets for years, and was project officer for this toss-bombing

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test. Major Moore, who would fly as co-pilot, was another youthful type but he had logged 1,150 hours in B-47s—which works out to exactly 23 times around the world. I knew I was flying with two of the best in the business.

"I don't anticipate trouble," Tinsley said. "But if you have to get out, grab that red handle and yank hard."

Trussed up in parachute, hard hat, oxygen mask, and safety straps, I could not lean forward far enough to see any handle, red or otherwise.

"You probably can't see it now," Tinsley said. "But don't worry. It will pop up automatically if you need it—as soon as I jettison the canopy. One thing, though. We'll be low. I may not have time to call you on the intercom. If I don't, I'll ring a bell."

Great, I thought, *particularly if you happen to lean on the bell button by mistake.*

Tinsley shoved his head into the cubbyhole in front of mine and grinned. "Don't get shook," he said. "Nothing is going to happen. You're safe as a church."

Sitting in the bombardier's position in a B-47 on a hot Florida afternoon must approximate how a rat would feel if it got trapped inside a TV set with all the tubes blazing. My reflection in the altimeter dial was a rubber snout (the oxygen mask), two slightly bloodshot eyes, and a patch of sweat-bathed forehead. The sweat was caused by the heat, the battle with the straps, and the talk of red handles.

"Harvey," Tinsley said over the intercom. "You set?"

"All set, Major."

The canopy dropped and locked and the cooling system began to spout cold air with little chunks of ice in it. Tinsley and Moore were making their preflight check over the intercom, sounding like Donald Duck's nephews plotting trouble for uncle. Then, without further delay, we rolled out and took off.

A B-47 takeoff is different. The six jets sound muted, almost puny, inside your crash helmet. The plane seems to be merely taxiing fast, instead of trying to get airborne, and you have a good look at all the hangars and planes and then, somewhere near the end of the runway, you get off very sluggishly and flat. But when the wheels thump into the belly

BOMB GOES ONE WAY, PLANE THE OTHER. Automatic gear releases the bomb when plane reaches just the right climb angle for a toss into

and she cleans herself up, you look at 350 on the airspeed right now!

This was a big day at Eglin, the culmination of a visit by hundreds of big wheels, and they were packed in a grandstand now to watch the fun.

"I'm a little late," Tinsley said over the intercom. "Usually I make a 15-mile run-in—so I can check all the gauges—but today I'm just going to rack it around and let 'em have it."

The B-47 began to shudder and bounce as we tore through thermal air currents rising from the hot sand and the roofs of an Eglin housing project. Tinsley laid a wing down steeply over the bay and the field came into view through one of the small observation ports. Our target was the intersection of the two main runways, directly in front of the improvised grandstand.

"Twenty seconds," somebody said. The plane leveled and began a very shallow power approach (it had to be shallow, since we were practically skimming the bay) and the airspeed went up as high as it can on a B-47.

Then Tinsley pulled up.

The only way to describe it is to say it's the great grand-daddy of all the elevator rides in the world. G-forces squeegeed me in the seat until I felt like an

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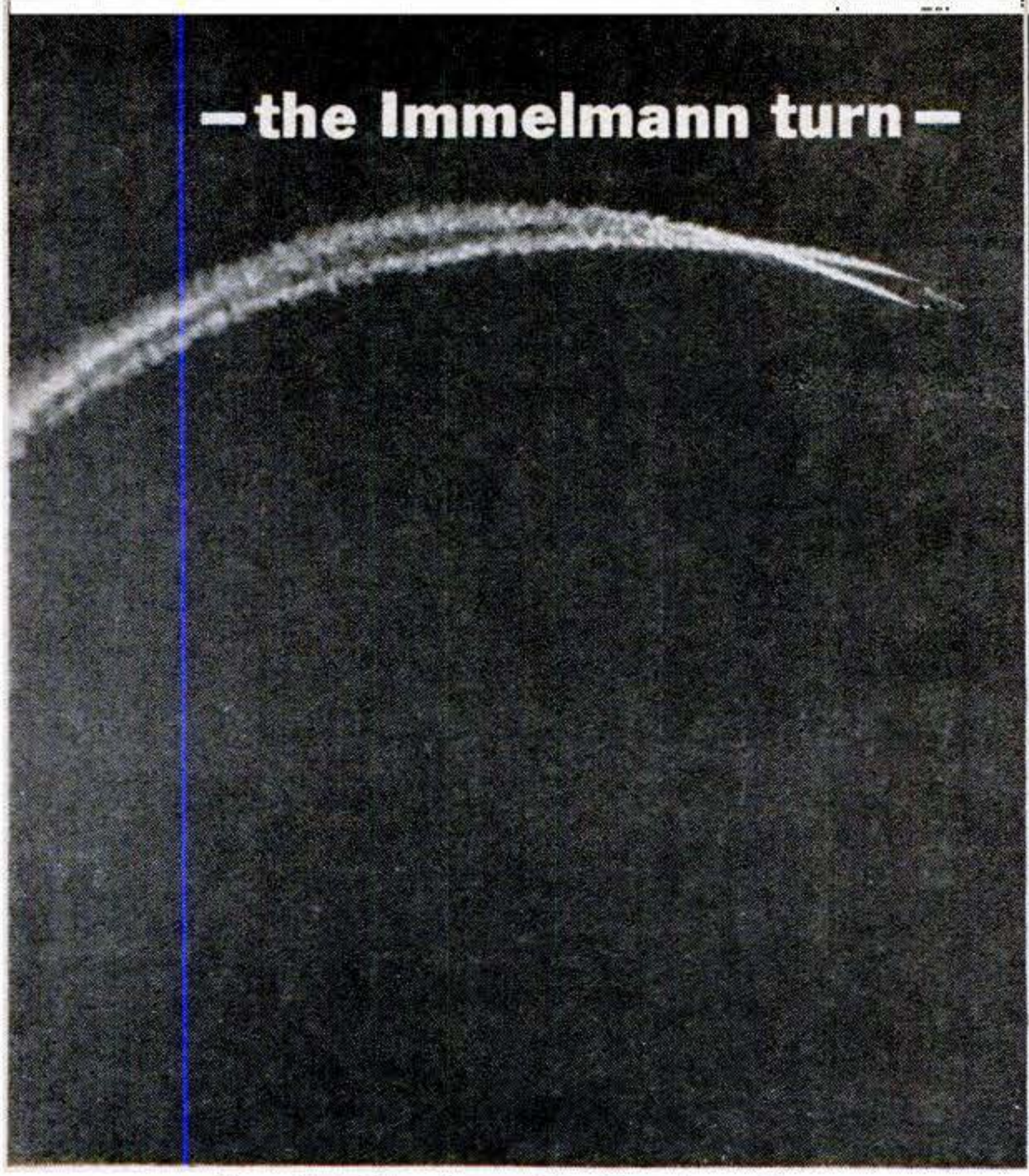
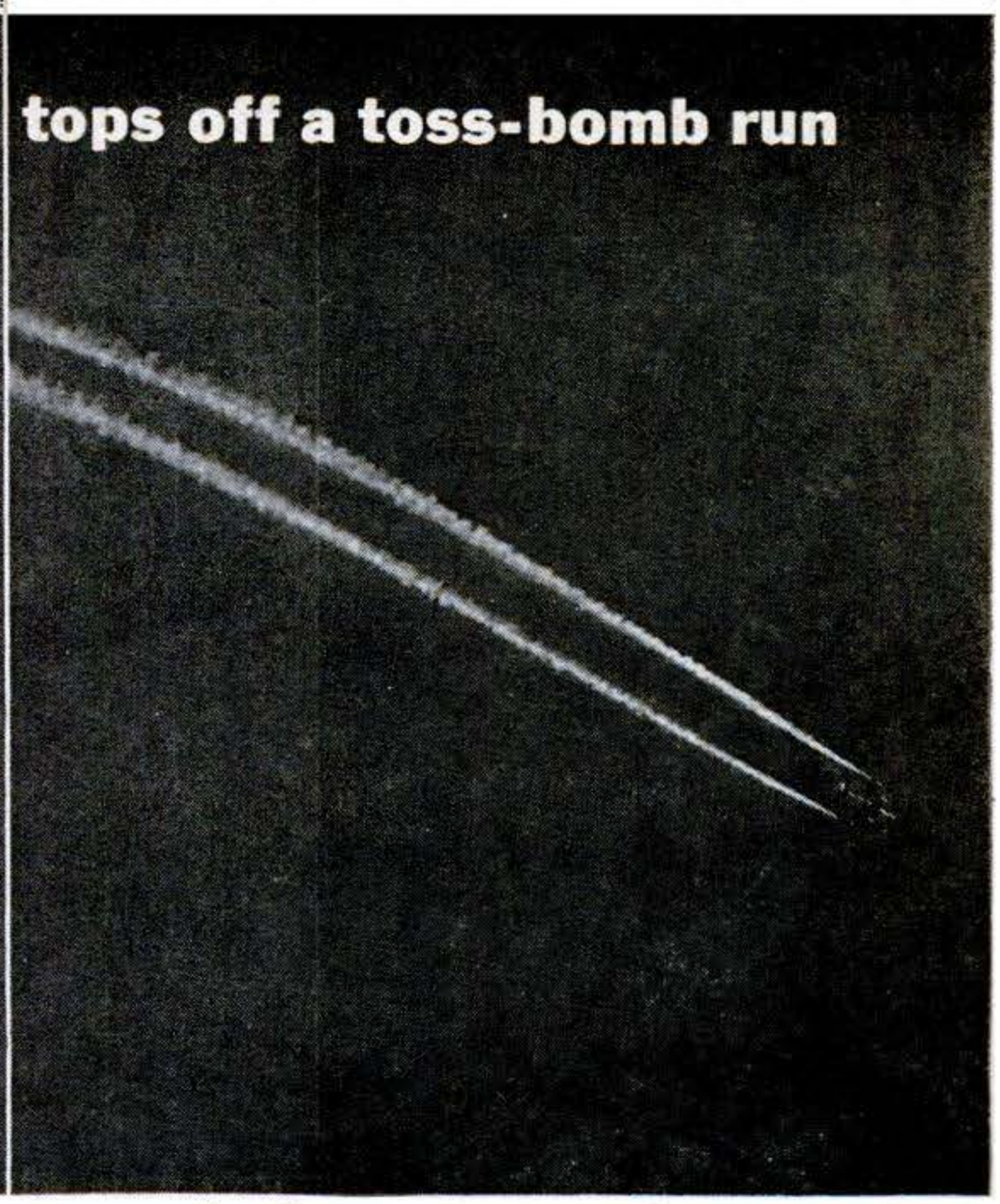




the "pickle barrel" (left). Pilot continues on his high-G loop—flying upside-down—to its top, then flips plane over (where marker trails cross). This completes Immelmann turn, leaves him flying straight and level back where he came from—safe from H-bomb blast.

Osborn cartoon: sagging eyeballs, flapping jowls and all. The altimeter began to wind like crazy. The two observation ports turned sky blue.

The big jet went up, up, up. Then, eerily, tiny houses and shorelines and palmetto barrens began swimming upside down across the ports, and I looked, for a split second, straight down at the intersection of the two main runways at Eglin Field, where dignitaries were no doubt squinting up at us. Then all was serene again and there was nothing but the blue sky in the windows.

"Damn it!" Tinsley said disgustedly. "I goofed on my rollout. Lost heading by three degrees!"

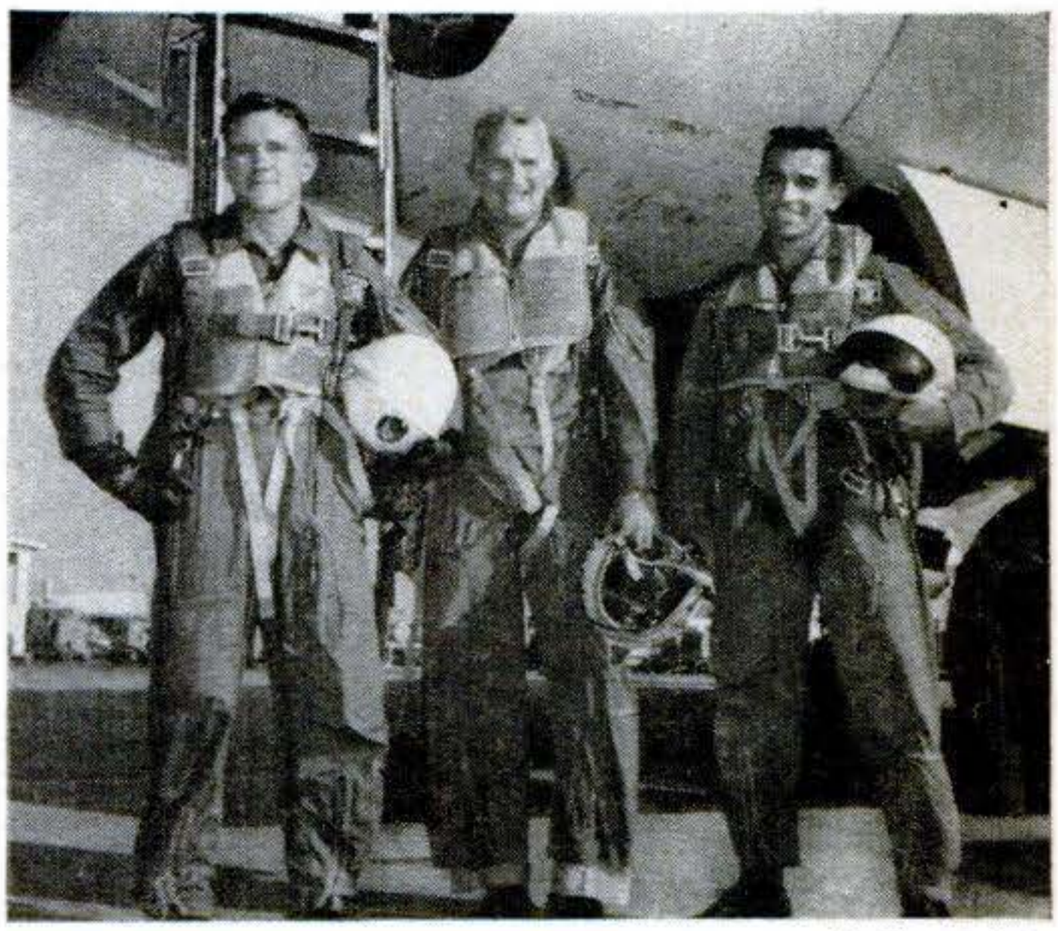
Three degrees, I thought. *This is a gnat's eyelash—a small gnat at that . . .*

"Where's the bomb?" I asked.

"No bomb this trip," Tinsley said. "Just the Immelmann. We wouldn't want to jar up those big wheels down there."

Back in the locker room later, Tinsley and Moore held a post-flight confab. It developed that we hadn't been quite as safe as that church they'd been talking about. For several seconds prior to the pull-up, Tinsley had been flying so fast that the flexible wings of the B-47 (which "flap" as much as 17 feet in heavy gusts) had warped in such a manner that he was riding on the thin edge of a phenomenon called "aileron reversal." If a wing had dropped and Tinsley had tried to lift it with ailerons (the usual method) it would have dropped further, and the B-47 might have rolled itself into a tight ball somewhere up near the Georgia border. Tinsley prudently had not risked this. He had abandoned the use of the ailerons altogether and steered the big bomber with

[*Continued on page 250*]



GOING FOR A TOSS-BOMB RIDE: at left, Maj. Marcus Tinsley, pilot; at right, Maj. Joe Moore, co-pilot. In the middle, perspiring but smiling thinly, is PS writer Frank Harvey.

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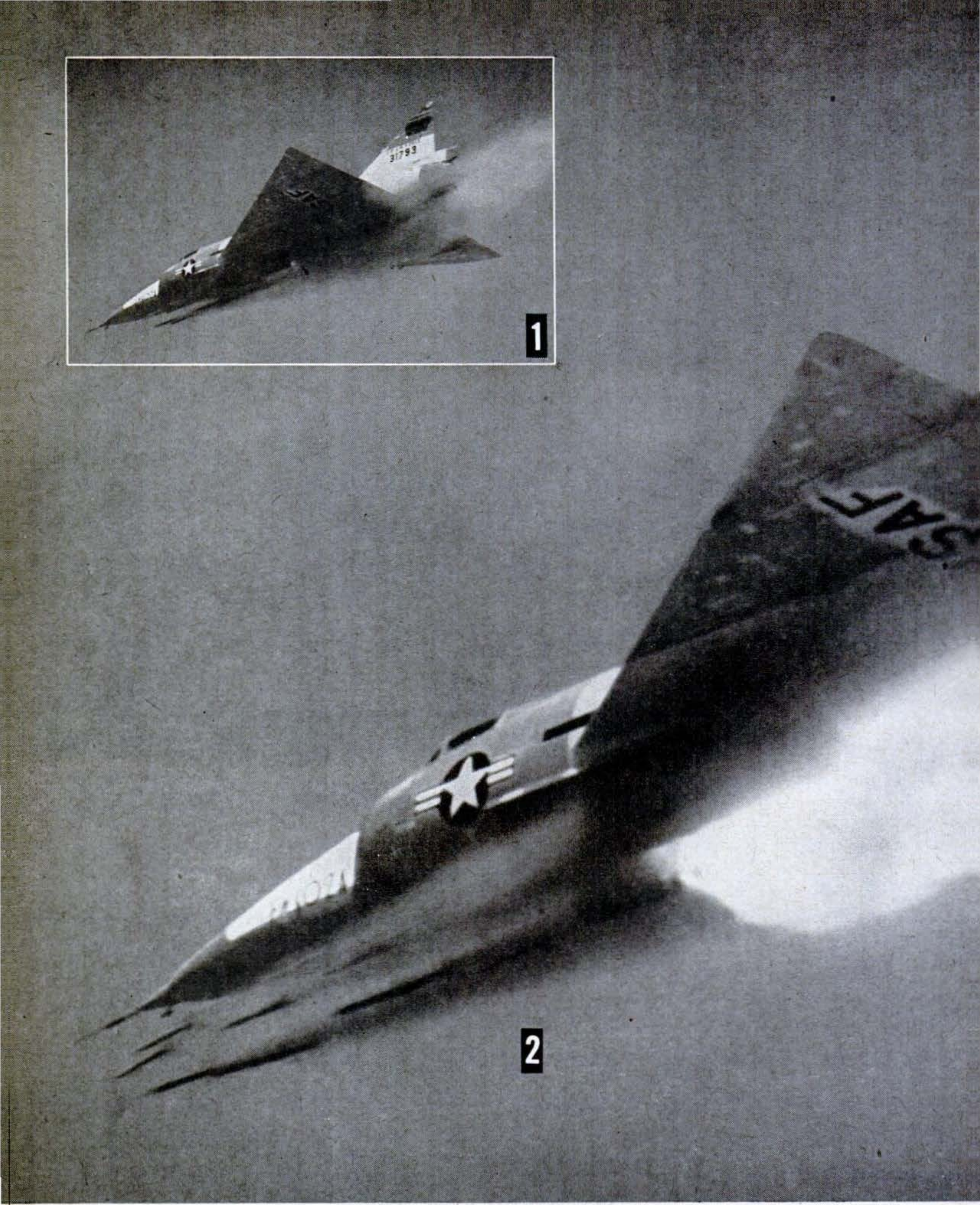

2

Delta Dagger spits salvo of supersonic rockets

IN A blast of flame this Convair F-102A Delta Dagger lets go a salvo of 24 folding-fin aircraft rockets during a test firing at Holloman Air Force Base. Photos taken a split second apart show: Upper left, first of 2.75-inch supersonic rockets leave firing tubes in the missile bay

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doors, at center a fifth of a second later the full blast of exhaust blends in one fiery burst, and right, a half-second later, the last of the rockets begin to outdistance the jet interceptor, itself faster than sound. A special enamel on the belly of the plane protects it from the blast. Scoops in the missile doors keep propellant debris out of the aircraft.

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GIs practice tank warfare in pint-size shooting gallery

MINIATURE silhouettes shaped like enemy tanks and traveling up to 50 m.p.h. on moving tracks help GIs of the U.S. Third Armored Division sharpen their shooting eyes at Friedberg, Germany. Gunners use 30-caliber machine guns on this range scaled down from 1,500 yards. Baffles at back (lower left) hold down ricochets. Target (right) collapses when hit.

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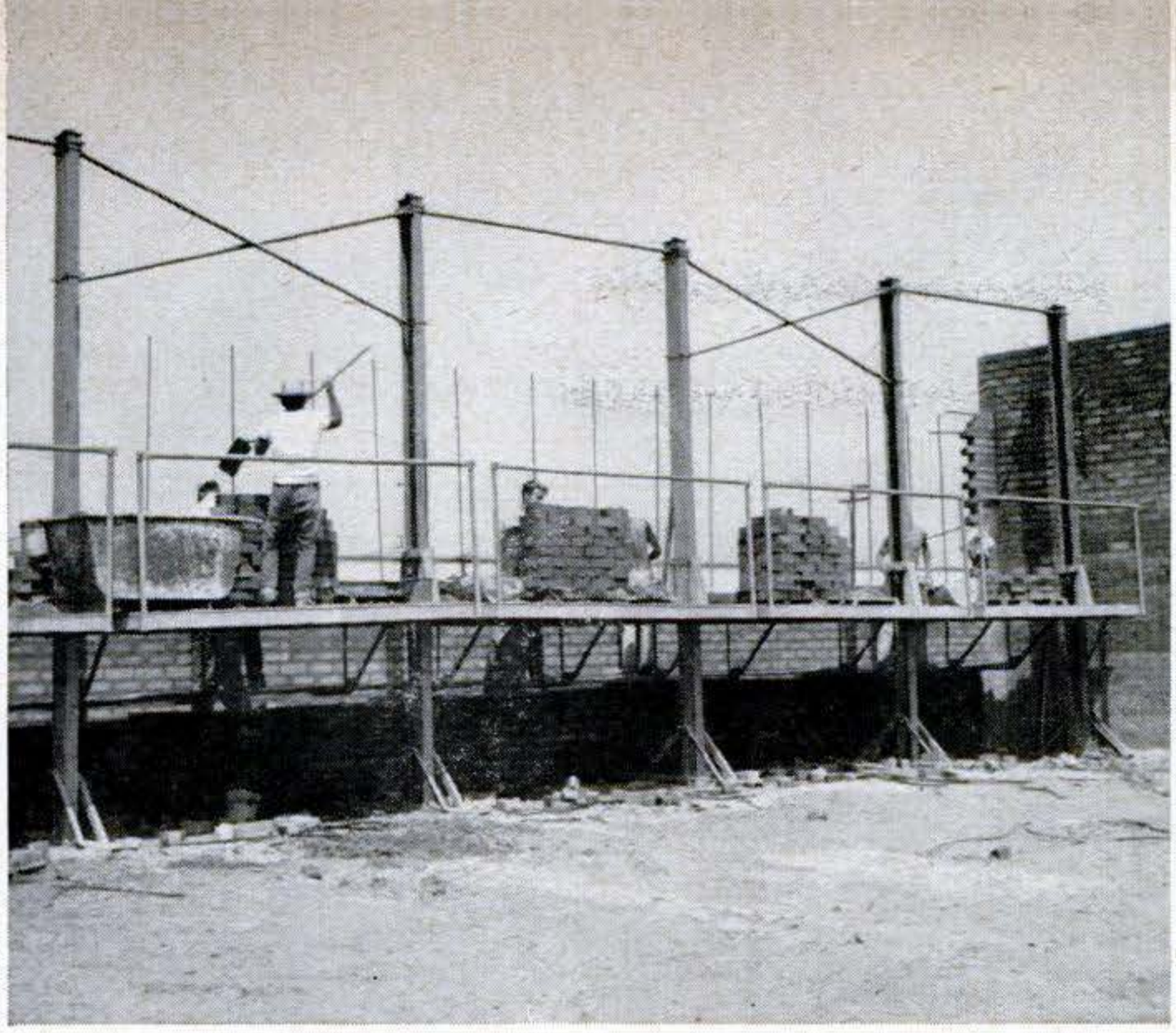
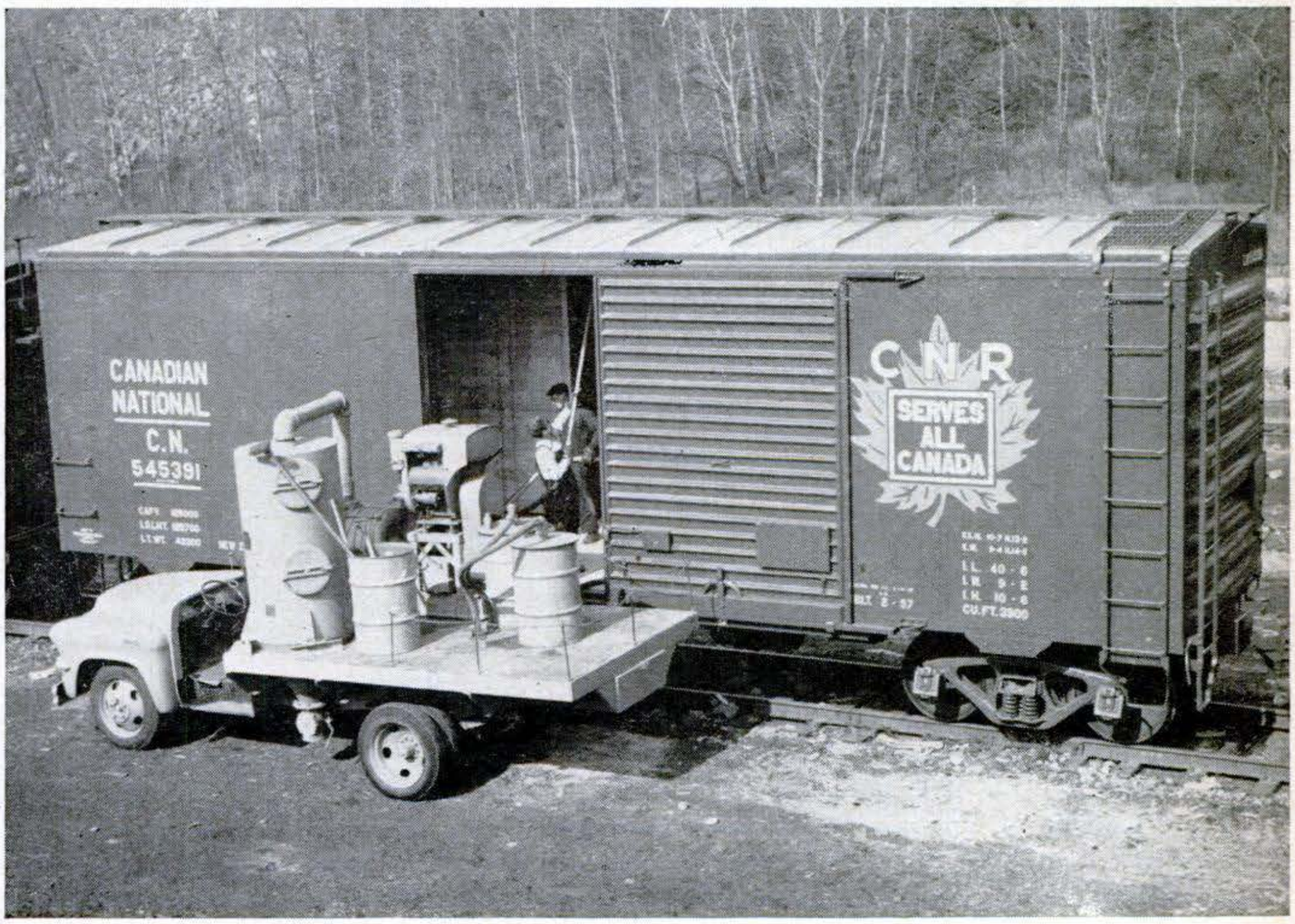


Electric drill sends this scaffold up or down

ALL you have to do to raise or lower this scaffold is plug in a hand drill and switch on the power. It turns a pinion meshed with a bevel gear which runs the height of a threaded upright. The scaffold comes in 10-foot sections, made by Power-Lift Scaffolding Corp. of Van Nuys, Calif.

Vacuum on a truck dry-cleans boxcars fast

ONE of eight such vacuum cleaners on the Canadian National Railways, this king-size version of a housewife's tool removes dust and powder from a boxcar in 15 minutes. Each is operated by a two-man gang. The trucks save labor and cut the time needed to get a car rolling again.



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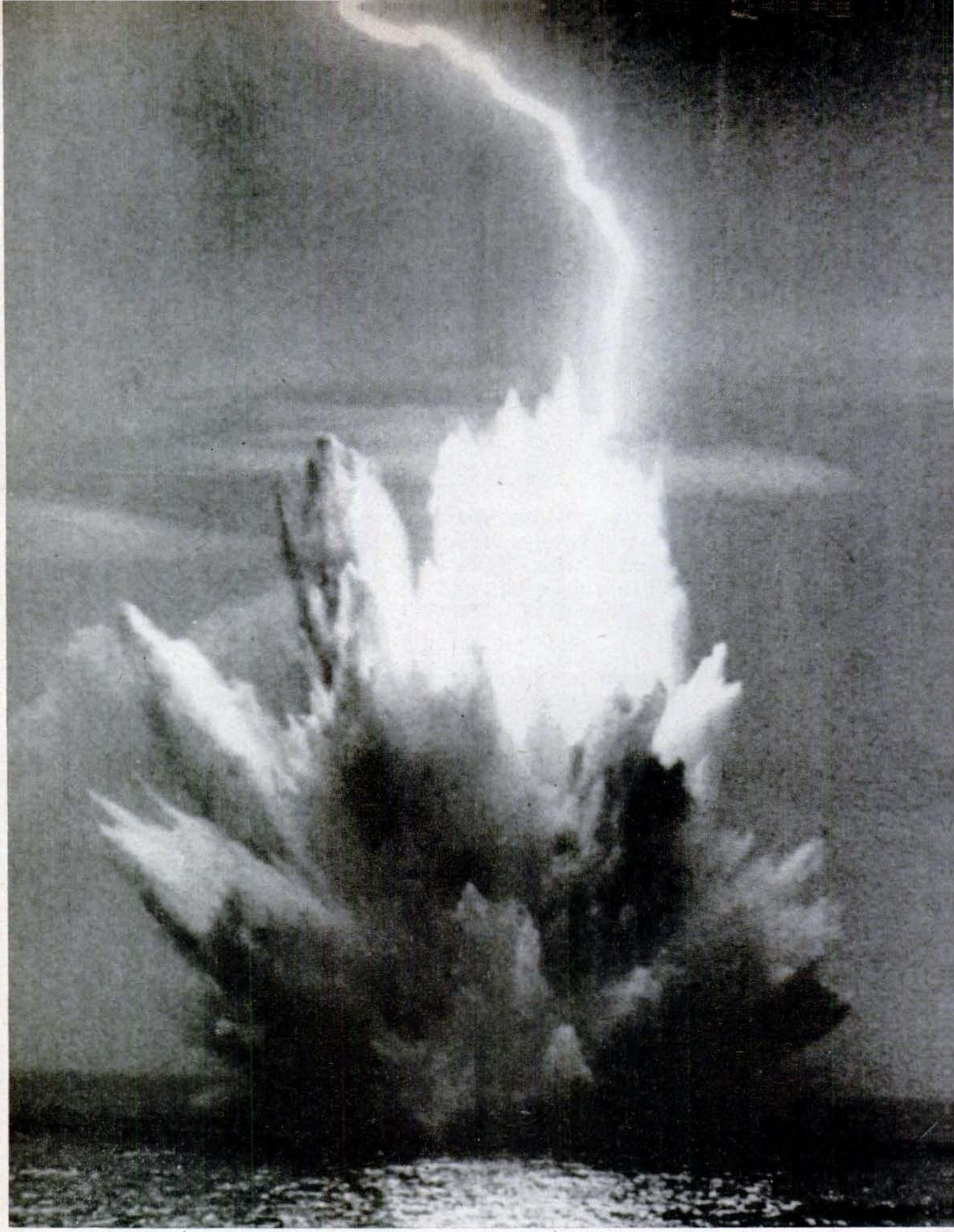

Plume of water from depth charge draws lightning

THREE lightning bolts were drawn from a stray cloud by a 300-foot water plume thrown up by a depth charge in Chesapeake Bay. This one struck dead center. All three bolts followed the same path, hit within one second. Navy Ordnance scientists say there is no method of computing the mathematical probability of such an occurrence. Benjamin Franklin once coaxed lightning from a cloud—with a kite and string.

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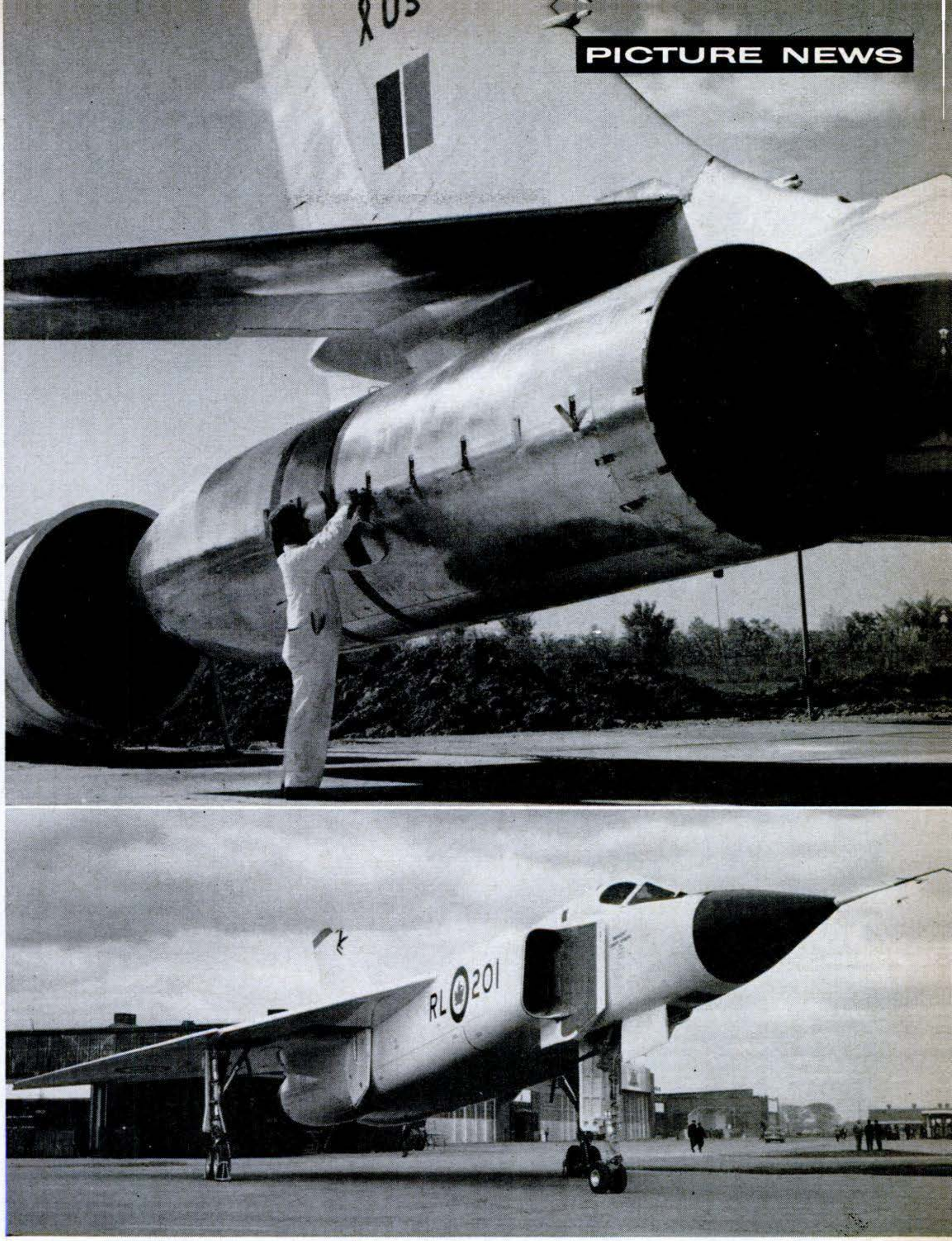

World's biggest jet fighter makes bow in Canada

THE largest jet fighter in the world, Canada's Avro CF-105 Arrow, is powered by two new Orendo Iroquois turbojets, shown on top being tested on a B-47 bomber. The Arrow itself, larger than a DC-4 airliner, is shown below with its rectangular air intakes. The Iroquois will give it 60,000 pounds of thrust, propel it at twice the speed of sound. Its big bomb bay, the size of a B-29's, will carry mainly air-to-air missiles.

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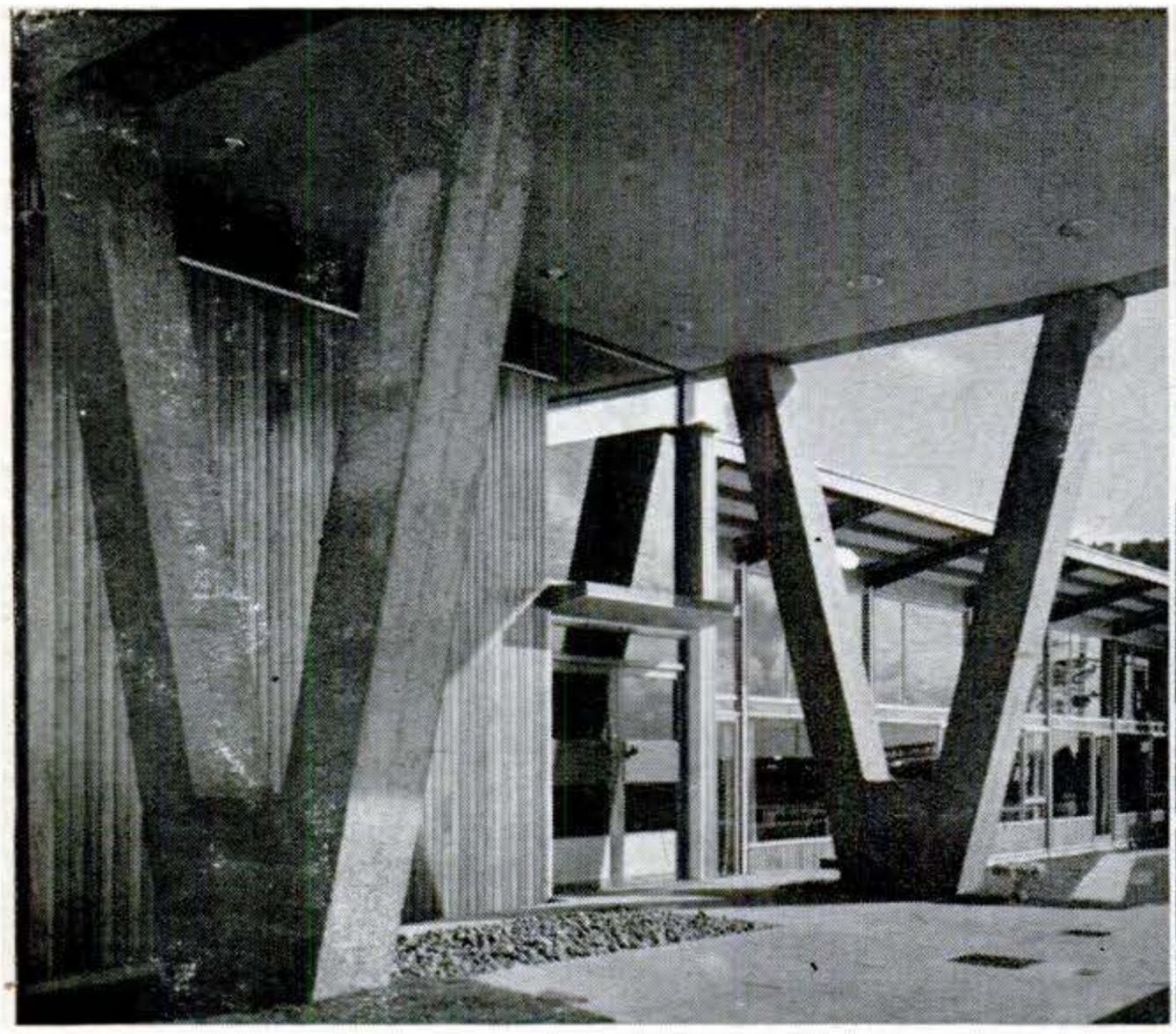
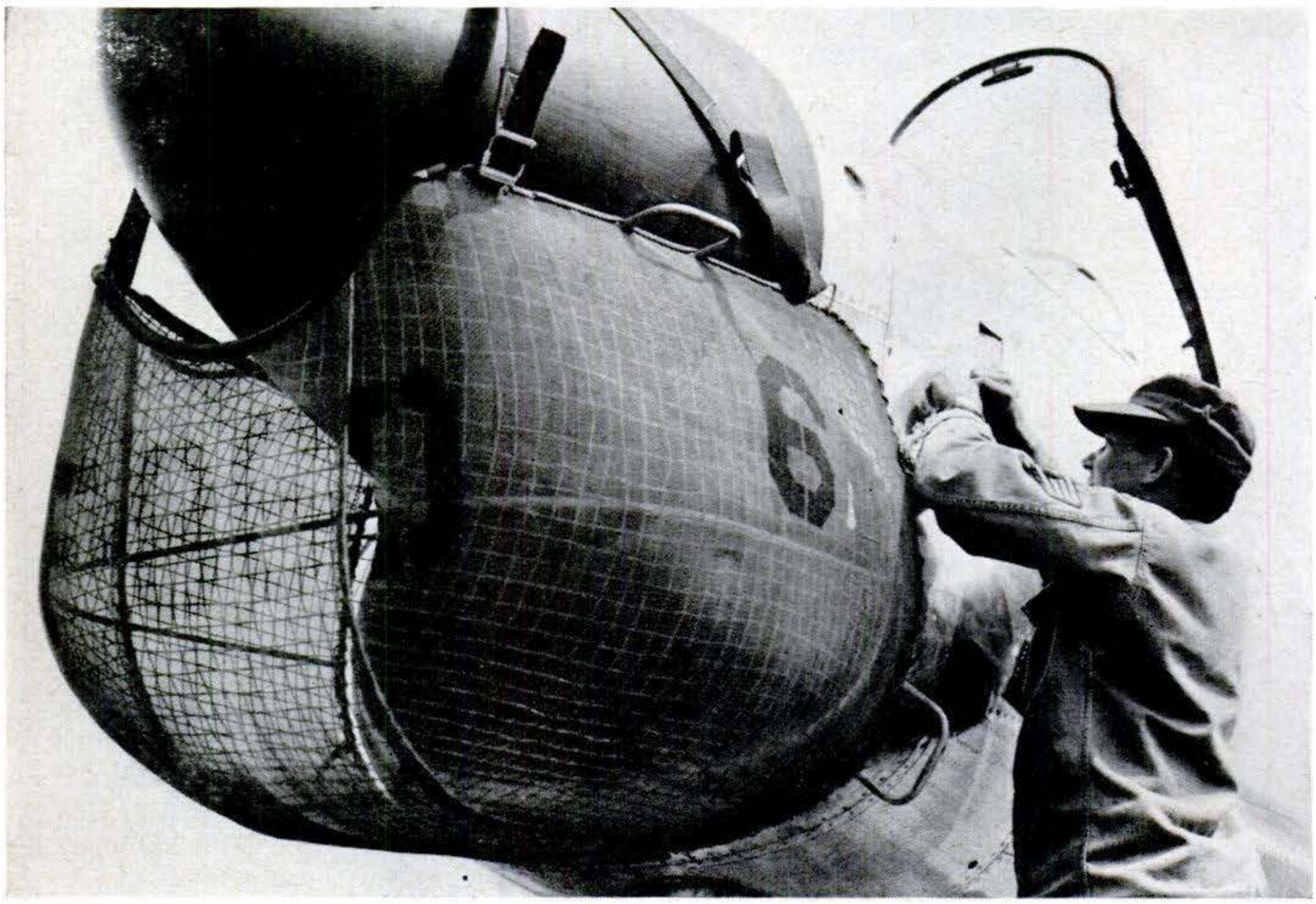


British hotel, on concrete V's, doubles as bus port

FOUR double pillars in the shape of V's support this new hotel at Dover, England, and provide driveway space for buses loading and unloading passengers. It caters chiefly to travelers taking the early-morning ferry to France. All bedrooms are glass-fronted and face the sea.

Nose bag on jet keeps runway dirt out of intake

WHAT looks like an old-fashioned feed bag for a horse on the plane below is a new taxi screen for jet fighters at the U. S. Air Force base in Yokota, Japan. It keeps dirt and trash from being sucked into the air intake during engine run-ups and taxiing. It comes off before takeoff.



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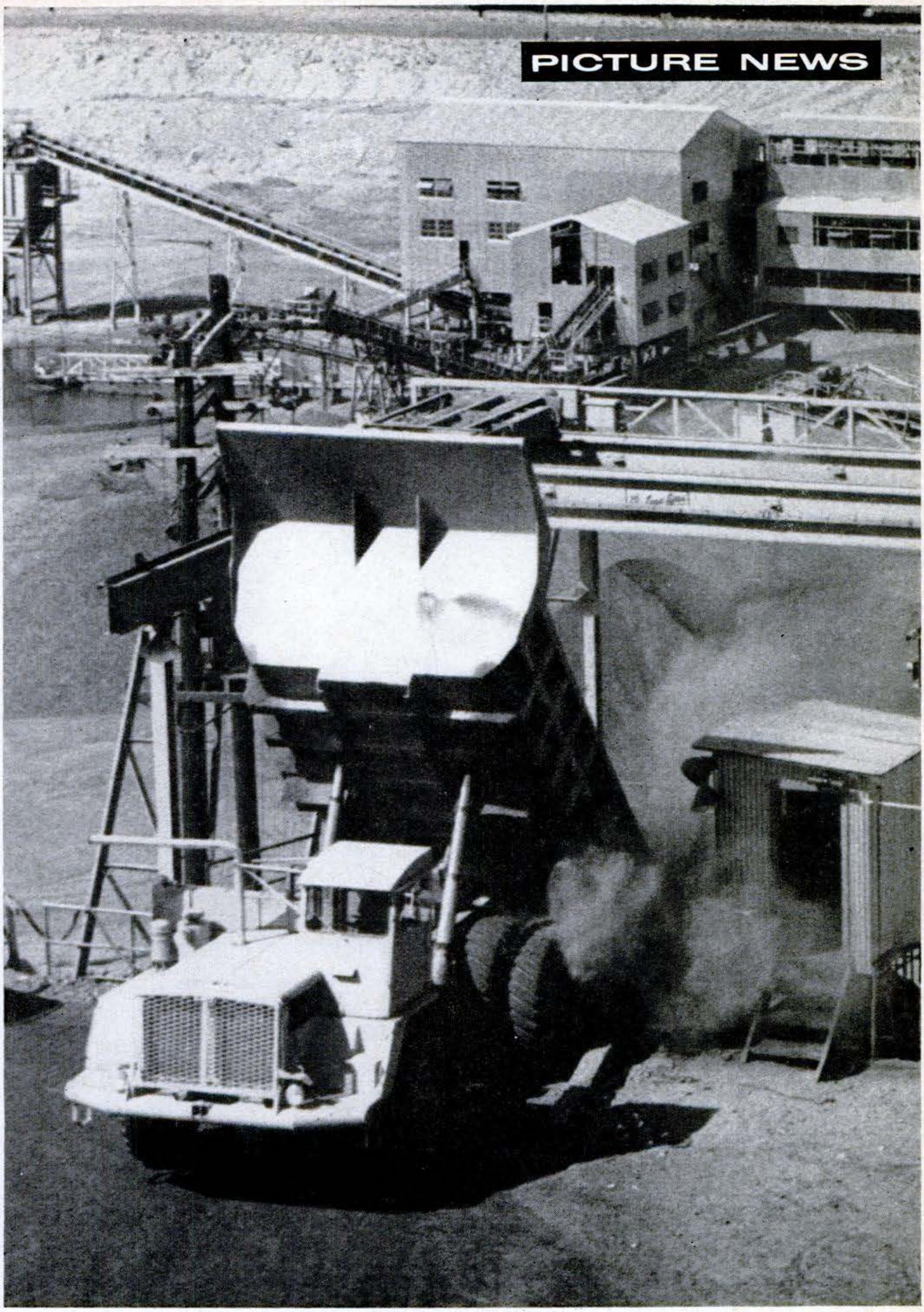

Mammoth dump truck hauls 40-ton load of iron ore

THREE of these trucks, each hauling 40 tons, move 480 tons of iron ore an hour from mine to crusher. Built by Kenworth Motor Truck for the Kaiser works at Eagle Mountain, Calif., they are powered by 300-hp. diesels and carry 70 gallons of oil for hydraulic mechanisms.

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He explores outer space—without leaving the earth

How to work 95 miles up in space is shown here by a scientist wearing a new flexible pressure suit in a vacuum tank. The overhead leash prevents a fall that might smash his glass faceplate. The vacuum is so nearly perfect that electronic tubes without a shell or envelope can be experimented on. Litton Industries built the equipment for the Air Force.

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Tiny French car goes 80 miles on a gallon of gas

ONE of the smallest of the small, this French Rollera drew big crowds at the Paris Motor Show. Here two uniformed firemen take a close look at the vehicle, which is said to be capable of a speed of 45 m.p.h. With fuel consumption rated at 80 miles to the gallon, it is economical, too.

Thump on his foot tells pilot he's in for a skid

THE warning device below, demonstrated by Goodyear, thumps a pilot's foot to tell him when to ease up on the brakes and avoid a locked wheel and a skid while landing. If any wheel's revolutions fall off abnormally, a generator in the axle starts up a vibrator mounted on his brake pedal.

Giant tetrapods guard beach at Navy's base in Spain

THESE concrete monsters, called tetrapods because of their four feet, are planted along the beach at the U. S. Navy's air-sea base at Rota, Spain. They weigh eight to 25 tons each, and are designed to curb wave

Home on wheels raises the roof for standing room

A HINGED plastic roof section on the traveling home below unfolds to give nearly seven feet of headroom. Seats in the Bedford Dormobile Caravan, made in Britain by General Motors, swivel, slide and tilt to form a double bed, two single beds, dining chairs or benches for riding.

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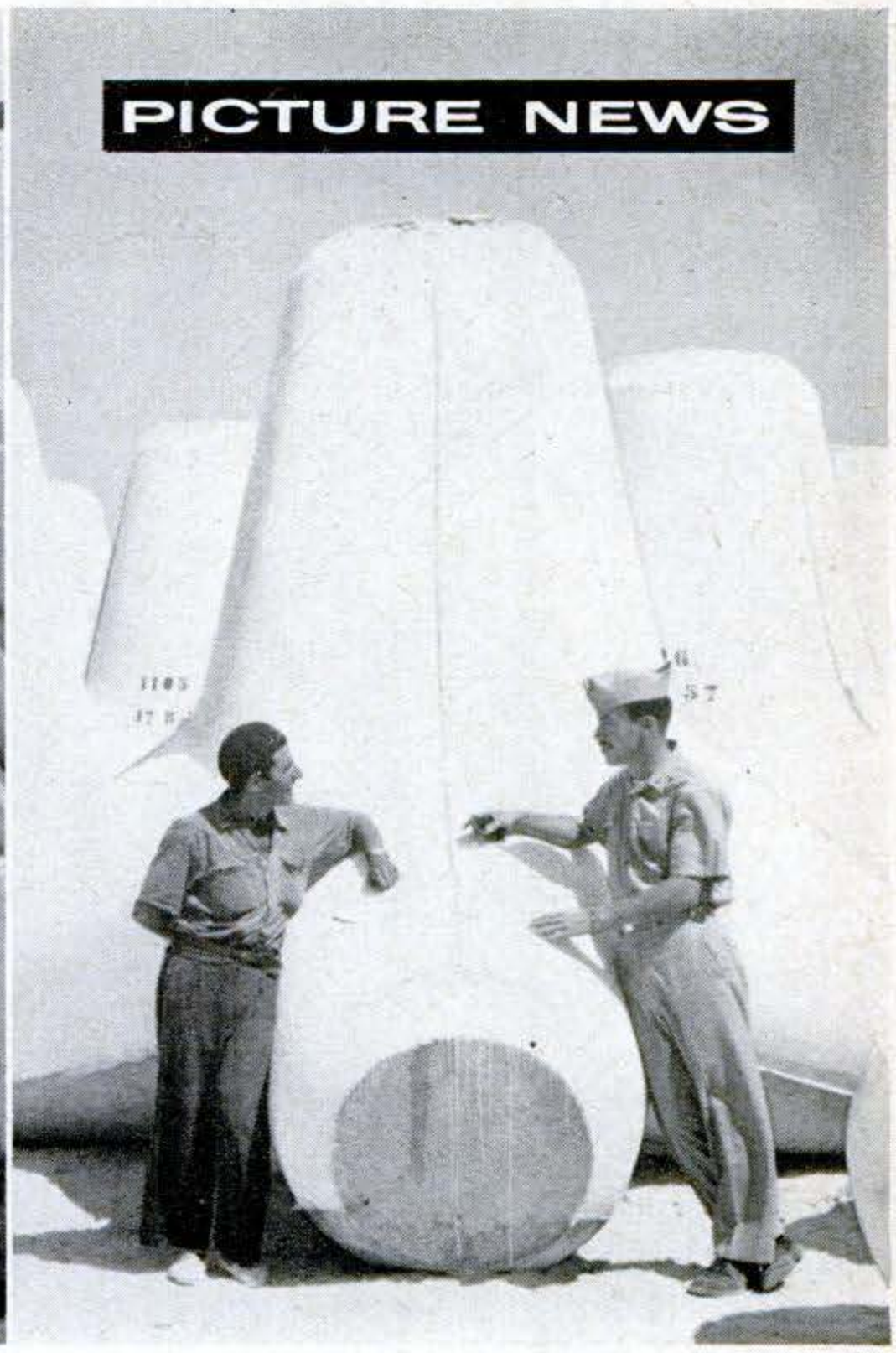
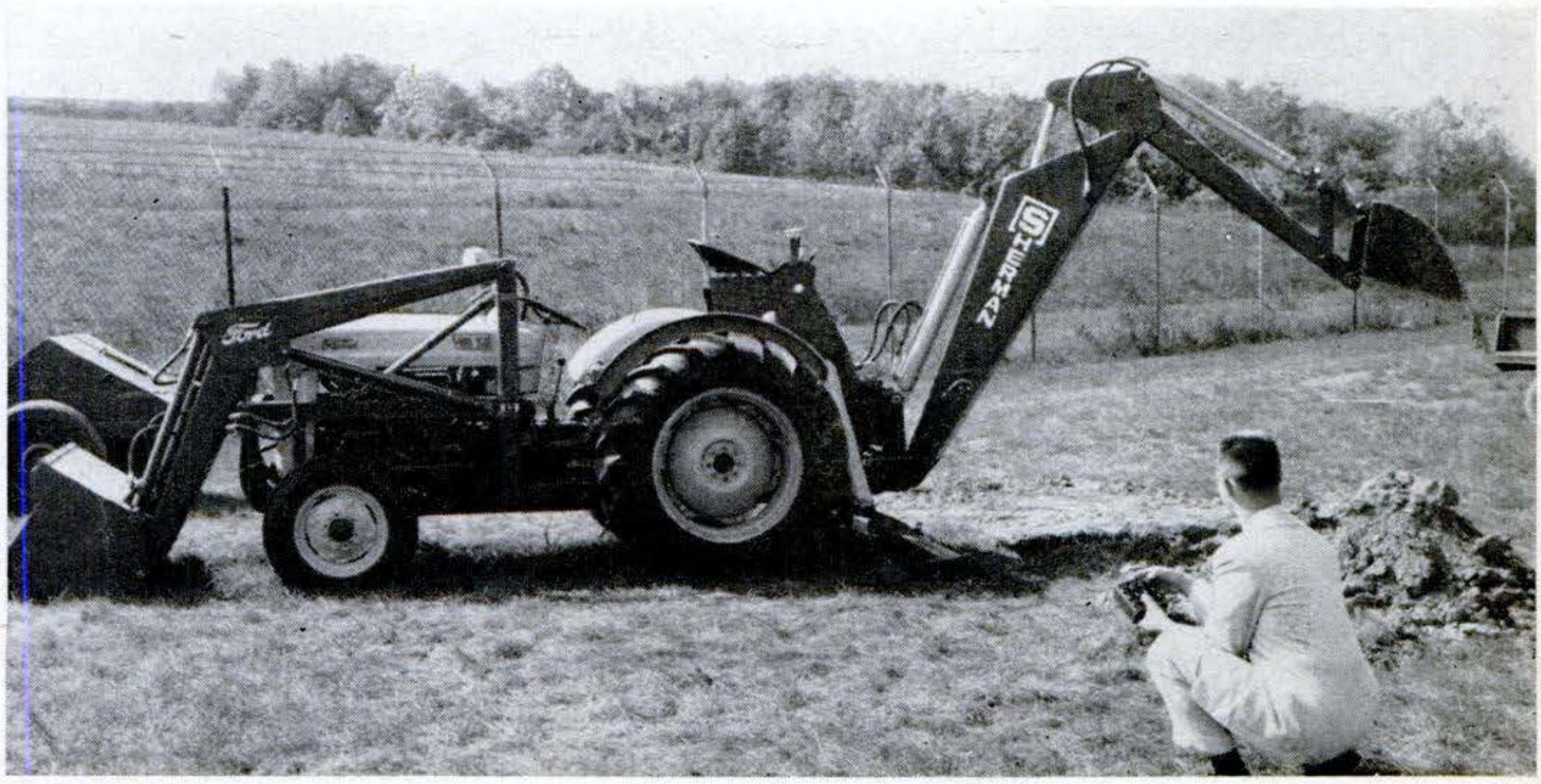


action at the base of breakwaters and a 1,200-by-1,600-foot fuel pier of T shape, shown under construction at the left. Located on the Atlantic near Cadiz, with direct access to the Mediterranean, the $120,000,000 base is one of the largest now being built overseas by the Navy.

Excavator shovel digs in by remote control

THE hydraulic system on this digger can be controlled at a distance for use where an operator might be in danger, as from fire, radioactivity, explosives. Pushbuttons and an electric cable work its six controls. Its maker, Sherman Products, plans to adapt it to radio control.



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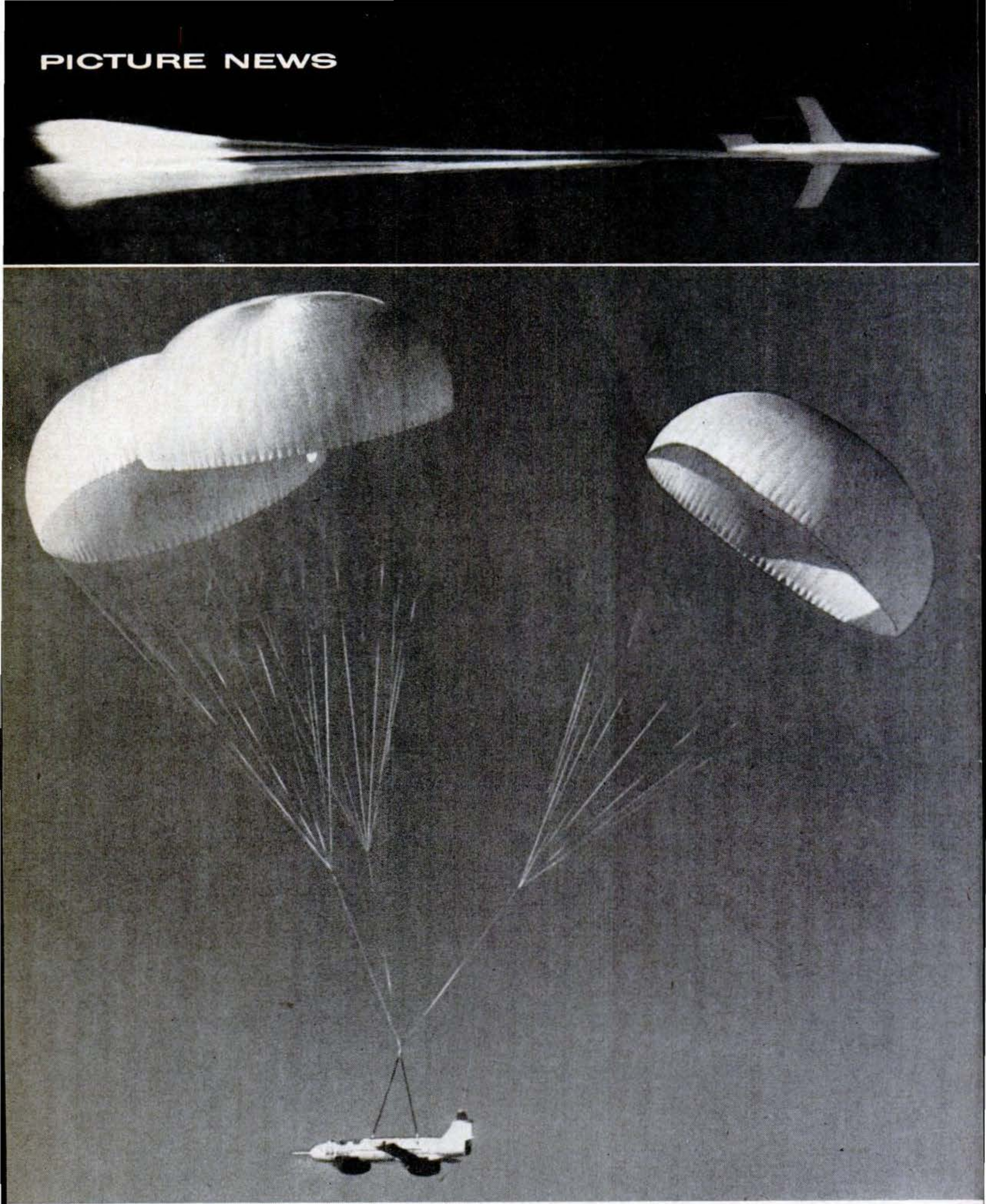

Matador gets chutes and air bags for safe recovery

CARRYING parachutes and cushioning air bags in place of a warhead, this $100,000 Matador guided missile will survive to be fired again in training tests. Punching recovery buttons in its guidance system, its ground pilot throttles down the engine, releases the chutes (top), pops the covers off the bags and fills them with air for a gentle landing.

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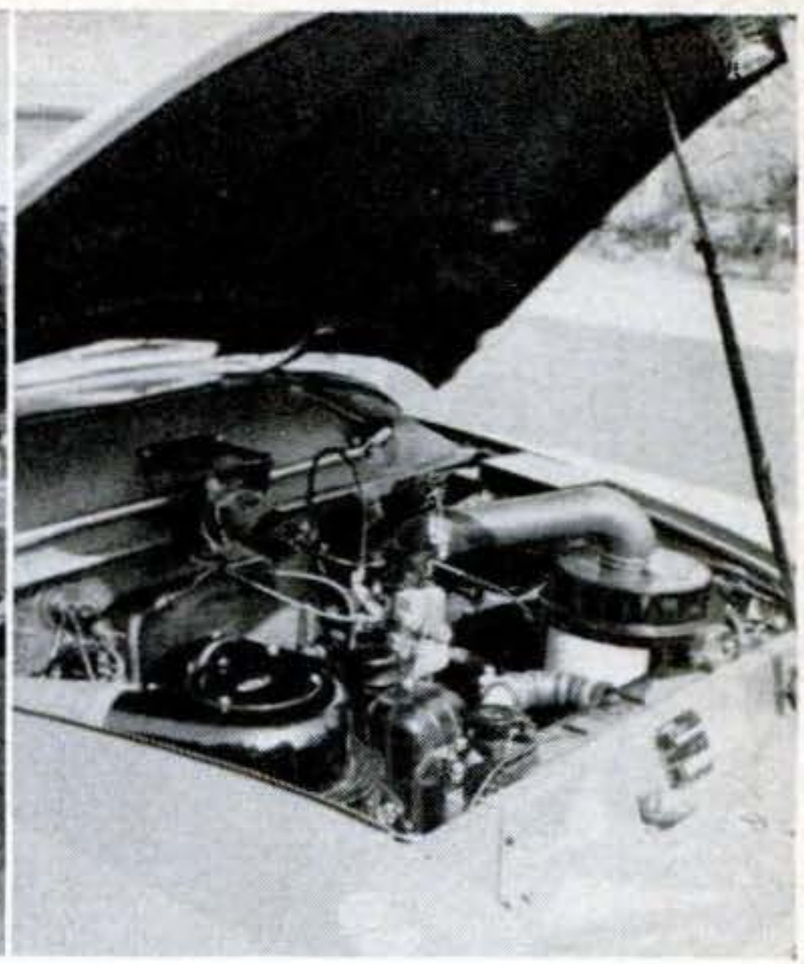

Japanese auto makes bid in U.S. foreign-car market

A NEWCOMER from the Orient is this four-cylinder, 55-hp. Toyopet: Japanese for "rich" plus English "pet." Styled like a shrunken '54 Plymouth, the 2,690-pound sedan can do 70 m.p.h. and gets 33 miles to the gallon. It has an 89-cu.-in., overhead-valve engine, costs up to $2,500.

Supersonic wind tunnel is built from old tank cars

NINE railroad tank cars stacked and joined together (below) form a 13,000-cubic-foot vacuum chamber, the heart of a new wind tunnel at the University of Michigan. Depending on valve and throat adjustments, air rushes into the vacuum at 1.3 to five times the speed of sound.

Half-mile track to race protons in new atom smasher

SOME 240 magnets in an underground half-mile circle will accelerate protons to 25 billion electron volts in this synchrotron being built at Brookhaven National Laboratory for high nuclear research. At left is the starter building, right the target building through which the track runs, and top a pool of magnet-cooling water. Boosted by 12 accelerator stations in the ring, protons will reach maximum energy in one second.

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Thin-tube TV screen seen from two sides

FLAT television (above), visible on both sides, may be in the very near offing. Kaiser engineers, the developers, say it awaits only quantity production of 2⅝-inch-thick envelopes. Only enough tubes are being built now for aircraft windshields (below), designed to give pilots a synthetic-electronic view of where they are going without need for watching blind-flying instruments.

Tiny rocket motors hurl borate bombs at forest fire

DESIGNED to reach pockets of brush or forest fire that are otherwise inaccessible, these rocket-powered bombs of smothering borate and their launchers can be assembled for firing in five minutes. Each missile consists of a cardboard container of 8.5 gallons of borate solution and a

GI's ride raft made of stretchers and truck tarp

LASHING together four litters and a canvas truck top, medics of the 25th Infantry Division rowed this simulated casualty ashore with shovels and the help of a towline. It was part of a field-expedient drill at Schofield Barracks, Hawaii. The raft stayed afloat for hours.

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2.8-pound rocket that hurls it 400 yards in six seconds. With two motors, it will travel 1,200 yards. The bomb can be fired singly or in salvos. It scatters borate over 400 square yards. A smaller extinguisher, hand held, without the rocket, has a 35-foot range, and four can be carried on the back. Grand Central Rocket Co., Redlands, Calif., developed the devices.

Motorized jack lets girl lead truck by the nose

ONE push of a button, and this corporal in the British WRAC can put a big army truck in a tight parking space with ease. She is using an electrically driven jack on wheels that raises the front end and pulls the truck wherever she leads. It is said to be capable of hauling 10 tons.

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Why Girls Are

Most juvenile delinquents are boys. How come we tend to bring out the good in our daughters and the bad in our sons?

By Jhan and June Robbins

FROM coast to coast hair-raising statistics tell a story of teen-age crime. Youthful offenders commit 53 percent of all burglaries, 66 percent of all auto thefts, and 18 percent of all rapes. Don't think that these young lawbreakers are the exclusive product of slums. In our most respectable old neighborhoods and in our shiny new suburbs there is a frightening rise in the number of juveniles who are violently, destructively delinquent.

An amazing fact stands out: *Most of our delinquents are boys.* Of over 300,000 juvenile-delinquency cases disposed of in 41 states, less than 60,000 involved girls. A son is four times more likely to get in trouble than a daughter. And when a girl does step across the legal line, statistics show that she will probably commit some mild delinquency like playing hookey from school. The more serious juvenile crimes, those that offer real harm to persons or property, are almost exclusively committed by boys.

Consider, for example, 122 juvenile-crime cases selected at random from court files for study by the Denver Area Welfare Council. Of the crimes, 114 were committed by boys, eight by girls. The estimated damage by theft and vandalism attributed to the boys was $80,367—to the girls, $240.

On a national scale. 374 Juvenile Courts in large cities dealt with 122,851 cases. The number of delinquent boys totaled 101,240, the girls 21,611. A partial breakdown of the offenses, by sex, reveals:

stealing:	boys—38,610	girls—2,269
truancy:	boys— 6,164	girls—2,517
vandalism:	boys—17,779	girls—1,462
injury to person:	boys— 2,828	girls— 396
traffic violations:	boys— 9,659	girls— 193

As drivers, teen-age girls have established such good records that insurance companies grant them the same insurance rates as adults. Boys, on the other hand, have proved so reckless and dangerous that insurance rates are considerably higher for them than for anyone else on the road.

Teachers, parents and police throughout the country are complaining that they can no longer control today's teenagers. They really mean that they can no longer control today's boys. Our girls, of course, are not complete strangers to trouble. Recently in New York City four girls ranging in age from 12 to 15 leaped upon a schoolmate as she was wheeling a baby in a carriage. They knocked her to the ground, kicked her and beat her with the buckle end of a heavy strap. The reason? She had refused an invitation to join their social club.

As the precinct authorities quickly pointed out, however, the case made headlines because it involved *girls.* On the streets of most of our larger cities, such occurrences among boys are so commonplace that they pass almost without notice.

Says Judge Paul W. Alexander of the

A son is four times more likely to get in trouble than a daughter, and his crime will probably be more serious

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So Good

Domestic Relations and Juvenile Court of Toledo, Ohio: "If boys behaved only half as well as girls, we could almost forget about juvenile delinquency."

Isn't it time we asked ourselves what makes girls so good? If we can find out we may uncover some valuable clues to our overall delinquency problem. Are we doing something special for our girls? Are we doing something wrong to our boys?

Most people will say, "It's just a matter of human nature. Boys are naturally wild, girls are naturally good. And that's all there is to it."

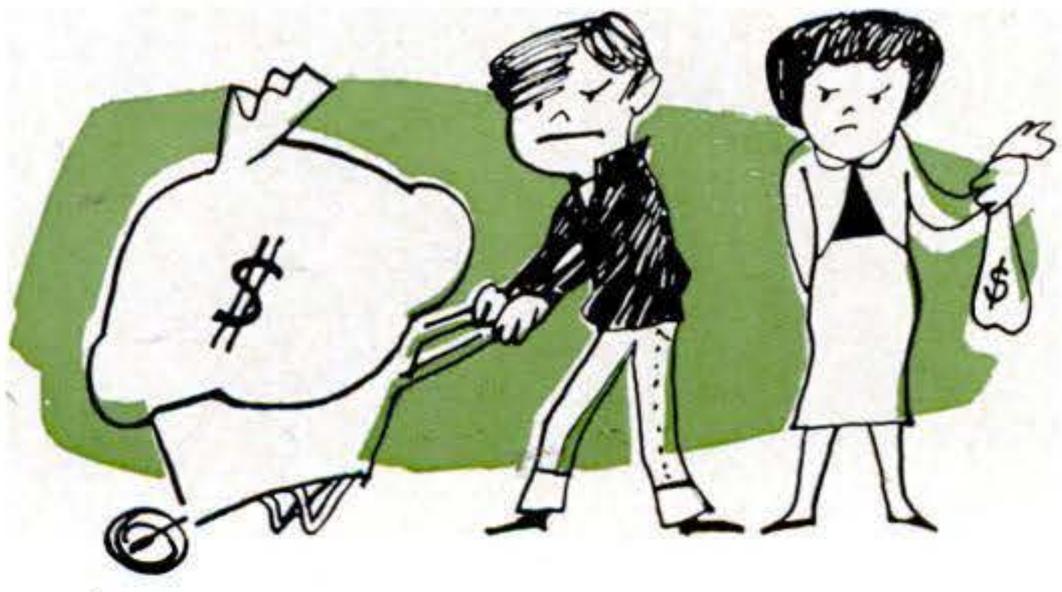
There is some support for this point of view. Dr. Ashley Montagu, chairman of the Department of Anthropology at Rutgers University, believes in the natural superiority of women all the way down the line. He says both sexes are equipped with built-in mental shock absorbers that help us endure a certain amount of annoyance without flying off the handle. Most females, however, Dr. Montagu says, are born with much better shock absorbers. Thus many girls can resign themselves fairly calmly to exasperating situations that bring the average male youngster roaring to his feet—or, worse, make him need to take things out on someone.

Likewise, Clarence G. Moser, a Y.M.C.A. expert on child behavior, reports, "Even at nursery-school levels, boys get angry more easily, are quicker to strike with hands or fists. Girls are naturally less quarrelsome, more interested in building and smoothing social pathways."

If these inborn differences exist, obviously we can't do much about them. But they don't tell the whole story. From the moment our babies are born, outside influences go to work. Here's how family, school and community help bring out the good in girls and the bad in boys:

Girls fear punishment more than boys do. Not that girls are cowards. Countless scientific tests have shown that females of every age rate high on enduring pain, discomfort and deprivation. Yet records show too that girls suffer much more acutely from being punished. This holds true even though a girl usually is less severely disciplined for the same offense than a boy. Schoolteachers have long known that a boy may grin impudently through a severe tongue-lashing while a girl will often dissolve into tears at a mild reproof.

A recent poll by Purdue University



In Denver, estimated damage by theft and vandalism attributed to boys was $80,367 —to girls, $240

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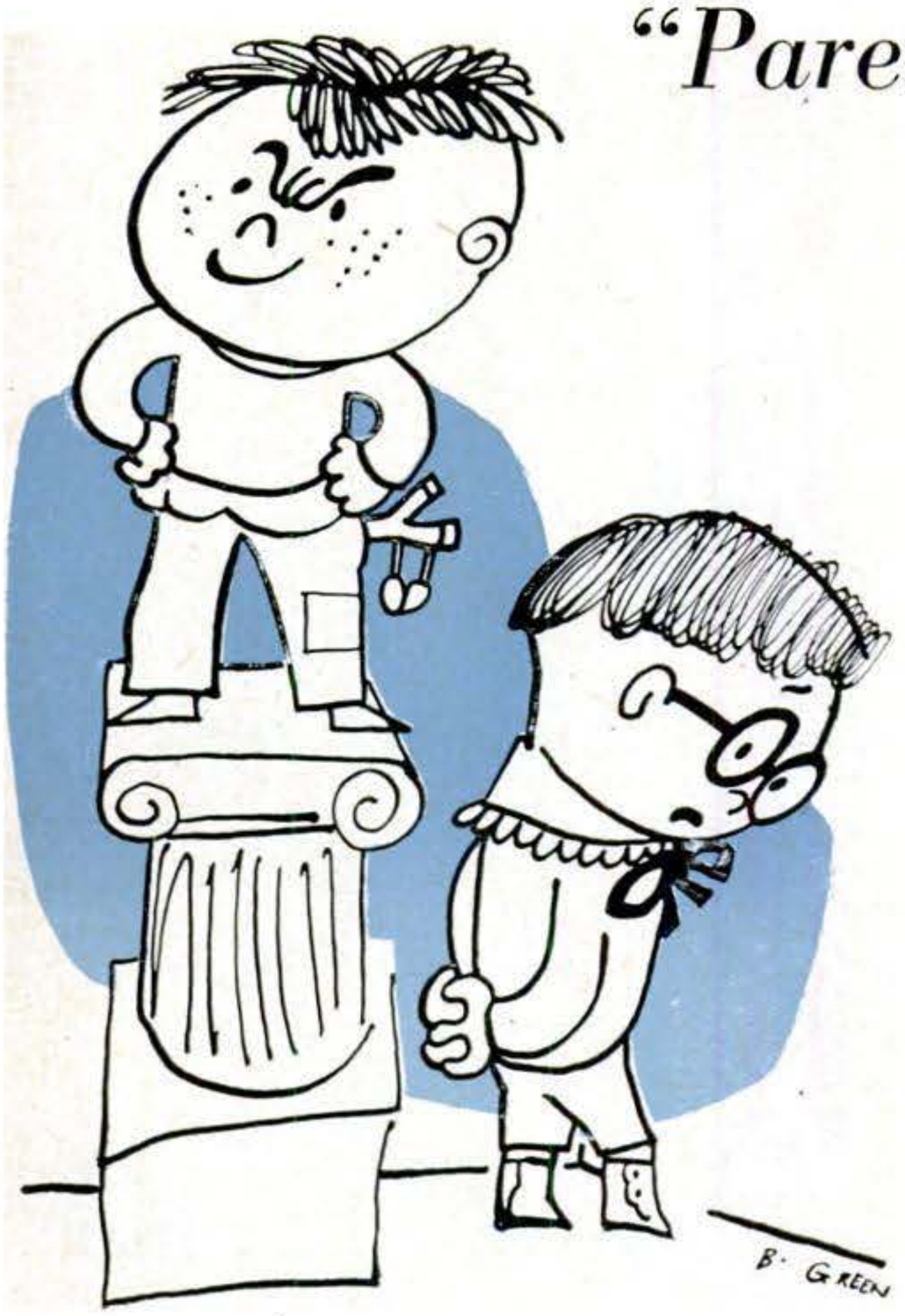
"Parents prefer Huckleberry



scientists, quizzing thousands of teen-agers, confirms this. Thirty-nine percent of the girls said their feelings were easily hurt—only 19 percent of the boys. Interestingly, 45 percent of the boys said they favored whipping or slapping by parents as a punishment for disobeying; only 27 percent of the girls agreed.

Girls are allowed to cry. Dr. Edward A. Strecker, former chairman of the Psychiatry Department in the University of Pennsylvania School of Medicine, says another reason for girls' good behavior is that they are allowed to weep, sob, scream, throw temper tantrums and even —in extreme instances—faint. All these emotional outlets, he notes, are denied to boys; they are thought to be girlish. If these ways aren't the most charming of feminine traits, still they do serve as pressure valves to let out anger or other pent-up feelings.

The girl who has been snubbed by a group of classmates or who fails to receive an invitation to an exciting party may go to her room, weep with rage and humiliation, and then feel much better. Her brother, in the same situation, must shrug it off with, "Who cares?" Later, however, he may crash the party or toss a few rocks through the window. He gets even.

Parents like bad boys but not bad girls. A ridiculous statement? Not so. Above all things, mothers and fathers want their girls to be "feminine" and their boys to be "masculine." Many are secretly pleased when their son gets into his first scrape. Father chuckles. "He's all boy—a chip off the old block." Mother shakes her head smilingly. "Boys will be boys."

A son who never gets into trouble or is regarded as teacher's pet is a cause for worry. Let him show a mild interest in poetry or ballet, and worry changes to panic. Most parents would rather struggle with a son who is a neighborhood terror than cope with one who is something of a sissy. As one psychiatrist put it, "They prefer Huckleberry Finn to Little Lord Fauntleroy."

A girl, on the other hand, is given no such choice of roles in the first place. Her parents smile most widely at her when she is dressed in ruffled pink organdy, playing tea party with her dolly and tottering about in Mama's high-heeled shoes. If she'd rather play football, break the neighbor's windows or sock the child next door in the eye, she is a tomboy. Unlike "chip off the old block," "tomboy" is seldom a term of affection. To insure her parents' approval a girl must be agreeable, well-mannered and well-scrubbed. She earns praise by getting good grades, keeping her room neat, writing thank-you letters on time. In

The driving records of teen-age girls are so good that insurance companies grant them the same rates as adults

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Finn to Little Lord Fauntleroy"

short, parents expect good behavior from their girls—and get it. They expect mischievous behavior from their boys—and often get more than they bargained for.

Girls are less gang-minded. Many adults acknowledge nowadays that when they see a gang of teen-age boys working their way down the block, fear strikes at their hearts. Many boys who as individuals can be trusted to behave themselves become irresponsible, antisocial and even vicious in a gang. Except in unusually depressed neighborhoods, girls seldom join gangs. They choose their friends for very different reasons. The typical boy gang leader is a braggart, a semi-delinquent, a lad who stays out late, breaks all the rules and doesn't give a darn. But the girl other girls want for a friend is usually pretty, well-dressed, and approved by teachers and parents.

Girls feel less need to follow the crowd. They may ape their friends' lipstick shades, dirty white shoes and autographed raincoats, but when it comes to social and moral standards they are far more likely to do what Mother would do. They find it easier than boys to say no.

Where does a girl get this ability to say no—and the traits that go with it? Authorities we talked with trace it to a built-in set of morals that she acquires long before her first evening dress. Dr. Elizabeth Douvan of the Institute for Social Research at the University of Michigan says, "A girl develops *internal* standards and controls at a much earlier age. She accepts the standards of her parents and adapts them to herself. A boy questions the rules, rebels against them and tries to construct new rules of his own."

Recently a large group of boys and girls were asked, "What would happen if parents didn't make rules?" The answers of the sexes agreed that without rules there'd be trouble—but were wide apart as to the *kind* of trouble.

The boys said that without parental controls: "The children would run wild. They'd get in with the wrong crowd. Nobody would go to school."

The girls replied, "The children's health would be injured. They'd get

Girls may weep, sob, scream, throw temper tantrums. But emotional outlets like these are denied to boys

spoiled. They'd think their parents didn't care what happened to them."

Half a family is easier on girls than on boys. Nearly 20 percent of American families today have absentee fathers. Some travel, some are in the armed forces, some overwork and have no time for their families. Some hold down two jobs. A sizeable number are divorced.

When the mother of the family is just about the only parent the children see, who suffers more? Child-rearing experts agree that such a situation is hard on most children. Yet the evidence seems clear that the loss of a father—whether by death, divorce or preoccupation—is harder on boys than on girls. Unless he is extremely fortunate in the matter of uncles and grandfathers, the boy is deprived of a model male figure—of someone to show him what it means to be a boy or how to deal with the problems of young manhood. A girl, too, loses valuable guidance by not having a father around. Yet she does have a mother to guide her through the sometimes painful emotional experiences of female adolescence. Girls confide in their mothers. Lacking a really understanding father, boys rarely confide in anyone.

The Purdue Opinion Poll, dealing with this aspect, reports: 42 percent of the boys questioned felt that no matter what happened on dates it should never be discussed in the home. Yet only 19 percent

[*Continued on page 244*]

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Can Your Youngster Learn a Trade in Military Service?

Here's the inside story on training in the armed forces: What it can do for your youngster—and what it cannot

By Vance Packard

RECRUITING appeals tell the story. Listen to what they say:

The Navy: "From the day you join, you earn while you learn. You will have the opportunity to qualify for training in the trade you desire . . . You will become a skilled technician."

The Army: "You may choose the technical course that you want. It will be reserved for you. You even get a written guarantee that a place is waiting for you in the classroom of your choice."

The Air Force: "Should you return to civilian status when your enlistment expires, you will have an excellent background for a technical or administrative job."

That's the pitch. Join up and learn a trade. But does it work? Will the military prepare your youngster for a satisfying and profitable career in civilian life? Or will he come out a skilled potato-peeler?

To find the answers to these questions, I recently visited Army posts, Air Force bases and Naval stations and talked to dozens of military and industrial training officials, educators and GIs themselves. What I learned is important to you, particularly if your youngster is soon to finish high school.

With international politics what they are today, your son will probably have to spend some time in uniform. It could pay him to enlist. Your daughter may *want* to enlist—and maybe she should.

The important points you need to consider, I found, are these:

- The *quantity* of training. You'll probably be surprised, as I was, to learn that the U.S. Department of Defense runs the largest educational system in the world. The reason is simple: It's not the old Army (or Navy or Air Force or Marines) any more. In this age of pushbutton warfare, with its science-fiction weapons, its atomic-powered fleets, its air and auto transport, its globe-circling network of supporting services, the armed forces need

That alert sailor on the facing page serves aboard one of the most extraordinary vessels in the U. S. Navy. He is Electronics Technician Third Class James L. Clapp of the ammunition ship USS Wrangell, better known to its crew as Wrangell University. Every man aboard has to study for advancement—orders of the Captain—whether he wants to or not. But he studies on Navy time (work gets done mornings; everybody goes to classes afternoons). And he can study whatever Navy subject he wants. Officers, in addition to their ship's assignments, bear school titles (the navigator is Dean of Celestial Studies). The Wrangell's program, while certainly not typical, indicates how all the services are pushing extra training.

PHOTO BY ROBERT D. BORST

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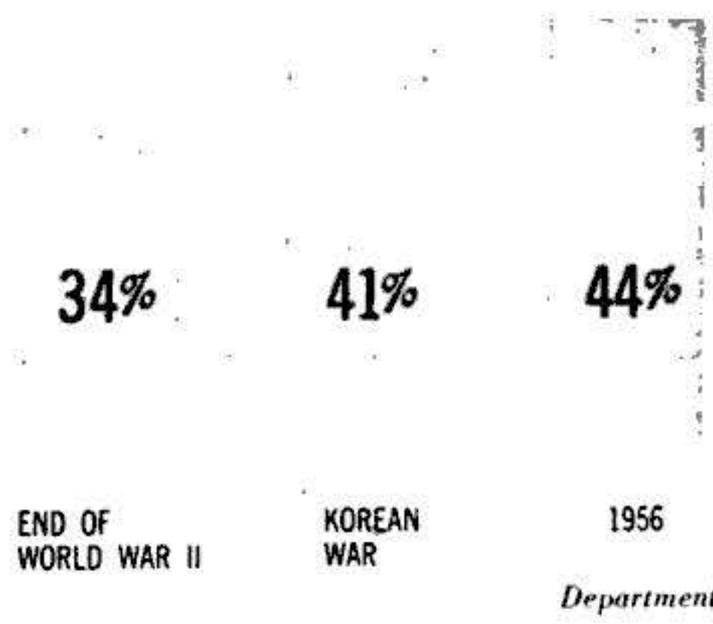
skilled specialists more than rifle-toters or deck-swabbers. Rarely can they hire these experts. They have to grow their own, training bright young men and women to be radarmen, aircraft mechanics, draftsmen and on and on through a list of hundreds of specialties.

• The *quality* of training. The U.S. Department of Labor rates specialists trained in the armed forces as "skilled workers" for many equivalent civilian occupations. One Air Force officer I talked to lamented, "We're training recruits all *too* successfully. Mechanics on the flight line have standing offers of good jobs

How military demand for skills is growing

Chart shows percentage of technicians and mechanics among all enlisted assignments.



Department of Defense

with commercial airlines. Diesel repairmen, recruited directly from high school and trained in service, leave after their enlistments are up to work for trucking companies."

You should keep in mind, though, that service training is brief, intensive, and *military* training. Much of it is not directly applicable to civilian work. We'll return to this point later on.

What will your youngster study? The armed forces practically invented the science of preselecting men for suitable jobs by psychological testing. (Air Force success in picking pilot material in World War II was phenomenal.) So your youngster in uniform will get aptitude tests more complete and more expert than he is likely to have had in high school.

The Air Force gives these tests in the second week of basic training. The results indicate which of eight "career fields"—mechanical, clerical, craftsman, electronics, equipment operator, technician, radio operator, services—the recruit should be trained for. He has a choice of any of three jobs in a field.

The other services do much the same thing. In the Army, enlistees can choose their school before signing up, but draftees have little or no choice. All four services emphasize the relation between military specialties and civilian careers, and publish books that include information on this point:

Army: *Army Occupations and You*
Navy: *Occupational Handbook*
Air Force: *Occupational Handbook*
Marines: *Jobs for You*

If the public or school library in your town does not have these manuals, you can get a copy by writing to the Office of Public Information of the branch of service you are interested in. The address is The Pentagon, Washington 25, D.C. Another source of such information is *Your Life Plans and the Armed Forces,* published by The American Council on Education, 1785 Massachusetts Ave. N.W., Washington, D.C.

Kinds of training. Once your youngster is launched in military service, he will find eight different ways open to advance his education. Let's examine them:

1. Specialist schools. The Army boasts that the only "tuition" for its fine schools is a high-school education. Many of its advanced courses are of college caliber. The subjects range from motion-picture photography to clinical psychology.

If your son takes the Army's 10-week course in "Automotive Fuel and Electrical System Repair," for example, he will learn the principles of internal-combustion engines as well as the construction, functioning and operation of fuel and electrical systems. If he gets into the Air Force's camera-repair school, he will be sent to Lowry Air Force Base in Colorado for a course running 145 academic days.

The Navy has more than 700 schools. About half of all enlisted men attend at least one. They train electronic technicians, enginemen, deep-sea divers, dental

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technicians, to mention a few. The Marine Corps has 140 schools that train nearly 500 different kinds of specialists.

2. *On-the-job training.* Formal schools are only the start of education for military specialists. In the Air Force, for example, the graduate of an aircraft radar-repair school is classified as an apprentice with a "3" rating. To progress to full technician—"7" rating—he will have to study almost continuously while on duty maintaining plane radars. The program is set for him, and he gets the books and help he needs. The Air Force claims that when a radarman leaves service for civilian life he is well qualified to become a TV repairman.

3. *On-base classes.* Wherever a group of men—usually at least 15—want to study a subject, a course is organized and texts and instructors provided. The subject need not directly concern their military jobs. When I visited Otis Air Force Base in Massachusetts this fall, two such courses were being conducted by instructors from Springfield College. One was in college algebra, the other in modern European history.

4. *Off-base night classes.* In most cases, the Government will pay three-fourths of the tuition if your son studies for school credit at a nearby campus. He'll usually get transportation to school, too.

5. *Correspondence courses.* The world's largest organization for adult education is The United States Armed Forces Institute—USAFI. Wherever in the world your youngster should be stationed, he can take correspondence courses during all the time he is in service simply by paying one $2 fee. It is perfectly feasible for him to earn a year or more of college credit through USAFI. Its catalogue, listing 280 courses, is available from: The Director, USAFI, Madison 3, Wis.

Besides that, servicemen can get correspondence courses from many colleges at half price through USAFI. And they can study correspondence courses offered by their particular branches (the Navy lists 250).

6. *School credits.* Did you know that your youngster can acquire credit on his record for school work without going to school? It's done by passing a "general educational development test," which

[Continued on page 248]

How much do military skills bring on the job market?

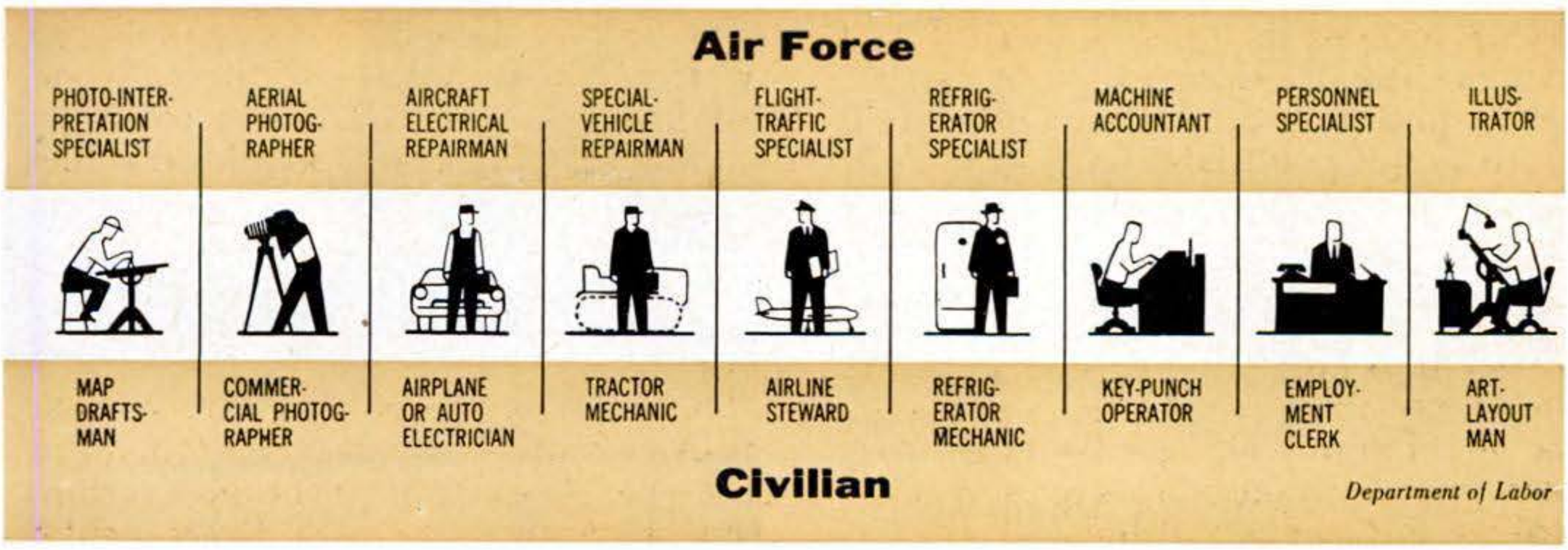
AVERAGE STARTING SALARIES in industry compared with pay and allowances of enlisted man, grade equivalent to Army corporal, three years' service (income taxes deducted in each case):

Enlisted man, Grade E-4	$2,098
Draftsman	2,930
Aircraft-engine mechanic	2,930
Truck driver's helper	3,263
Radio repairman	3,300
Instrument man	3,380
Armament mechanic	3,540
Radio operator	3,580

Department of Defense

How military training fits civilian jobs

Typical Air Force specialties, with civilian equivalents:



Department of Labor

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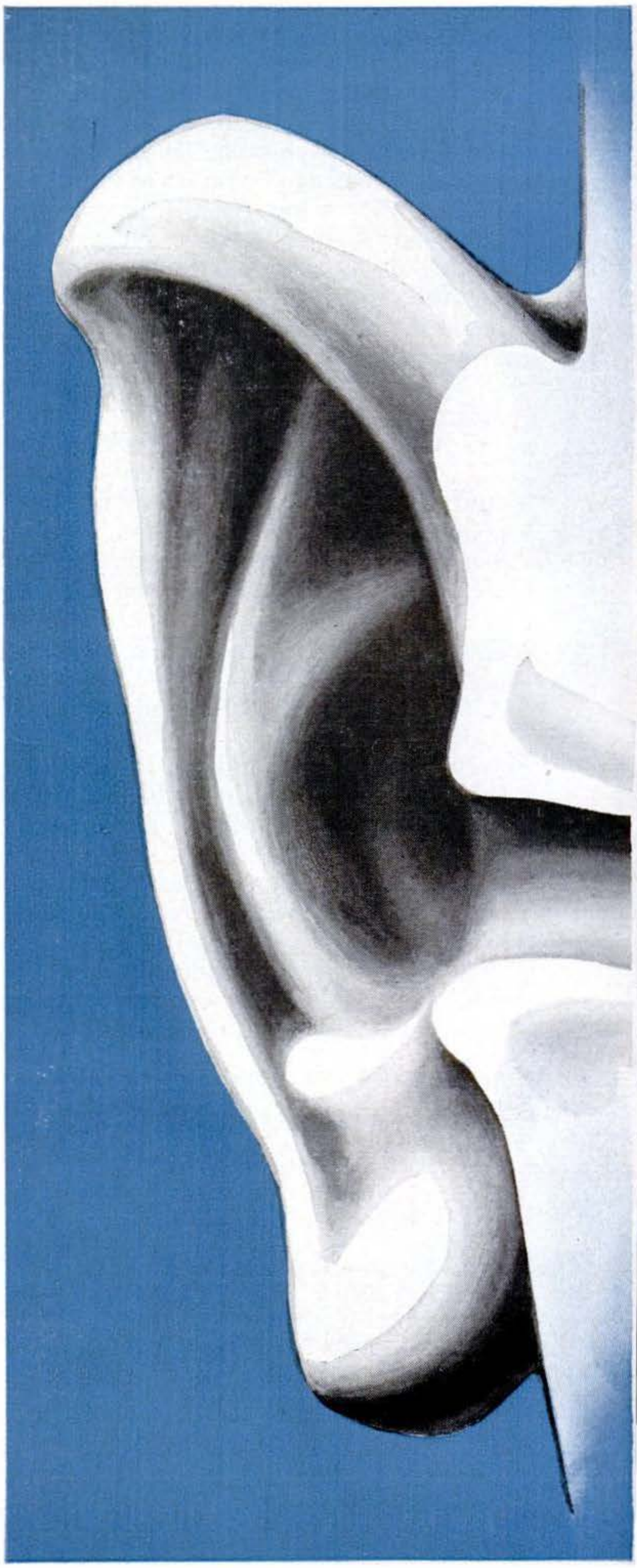
The Wonderful

With matchless sensitivity our ears respond to the faintest whisper—or a jet plane's roar

By Wesley S. Griswold



TODAY, more than ever before, we depend upon our hearing not only for a major part of our contact with the world, but for our everyday enjoyment of living. Consider modern entertainment—television, movies, radio. What would they be worth to you if you couldn't hear? Now Americans by the million are making a hobby of music—listening to it on hi-fi sets or at concerts or learning to play instruments themselves. Their fun depends wholly on that taken-for-granted but perfectly amazing mechanism, the ear.

No microphone ever built is as sensitive over as wide a range as our ears. We can hear and identify not only a faint whisper but a sound at least a trillion times more intense. We can recognize more than 300,000 variations of sound.

Our ears even know what *not* to hear—they filter out just enough low frequencies to spare us the constant gurgle of our bloodstreams, the rustle of our muscles. As a matter of fact, in an acoustically "dead" room, which shuts out all outside sounds and prevents sounds within from echoing, we can hear our hearts beat and even notice tiny crackles of static electricity produced by our own bodies.

How do we hear? By a mysterious teamwork between ears and brain. Our ears translate waves into nerve impulses, which are flashed to the brain. The brain "reads" these impulses, then tells us who or what made the sound; whether it was soft or loud, low or high, nearby or far away; what direction it came from; and whether the sound-maker was moving or standing still.

Most of the time, this incredible performance takes place in a fraction of an instant. Rarely does a sound puzzle us for a moment, even when we can't see its source.

This then is the most elaborate hearing

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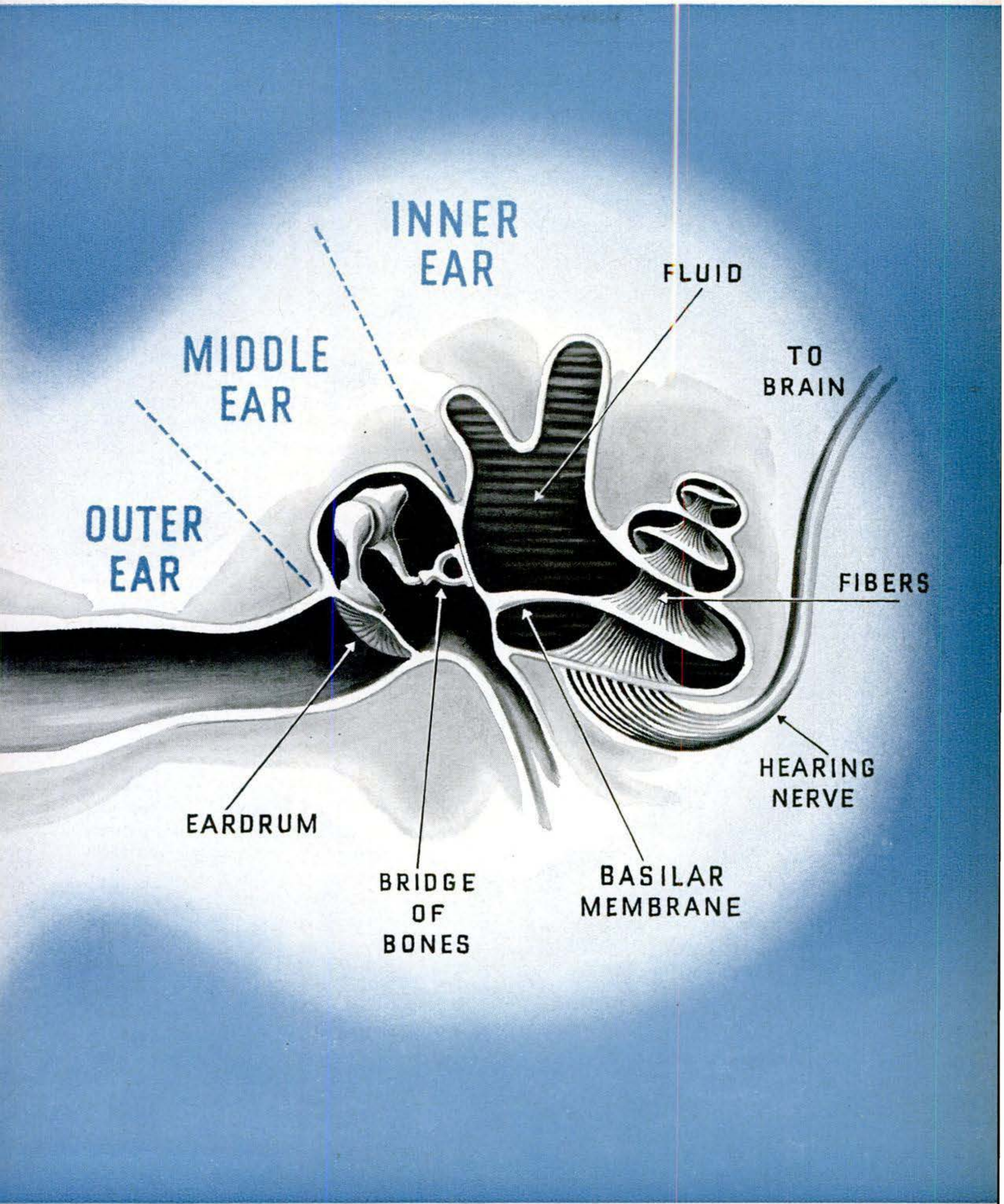
Way We Hear



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machine ever built. What are its components?

The ear itself has three parts—outer, middle and inner. But the brain is essential, too, so it must be considered a fourth part of the mechanism. Those flaps that decorate the sides of your head aren't really important. If they weren't there, you could hear just about as well as you do now.

As a sound wave enters one of your ears, it smacks against the eardrum, which bulges slightly with the impact. So wondrously sensitive is the eardrum that a certain note (two octaves above middle C), played barely loud enough for you to hear, moves it a distance equal to only one-tenth the diameter of a hydrogen atom! You couldn't *see* so minute a movement even with the world's most powerful microscope.

Like a hydraulic press, the ear multiplies pressure by concentrating it in a smaller area. A sound wave strikes the eardrum, passes along a movable bridge of bones in the middle ear, and—amplified 22 times—is transmitted to the inner ear by the tiny, piston-like stirrup bone.

The chamber of the inner ear is filled with fluid, and in it is the fantastic basilar membrane.

This membrane, attached to the underside of the hearing nerve, contains around 24,000 fibers of varying lengths. They are arranged like the strings of a harp. Ear experts say that the shorter, thinner fibers respond to high-frequency sounds, the longer, thicker ones to low-frequency sounds. Thus they help us to tell the pitch of a note or voice.

Here, according to the latest research, is what the experts think happens when an arriving sound wave enters the fluid of the inner ear. The wave moves certain fibers of the basilar membrane. As the fibers move, they cause overlying hair cells in the hearing nerve to bend. In bending, the hair cells trigger nerve impulses, which shoot to the brain. The brain compares these impulses with patterns stored away in its memory, and identifies them for you. You then know what sound you have heard.

The amazing variety of those hair cells in the nerve of hearing is believed to be the secret behind your telling whether the sound was loud or faint. Some cells respond only to a whisper. Others are stirred only by the crash of thunder. And in between there are cells responsive to every variation in the level of sound up to noises that actually hurt.

Why will a dog's ears prick up at a sound you can't even hear? Simply because dogs, like all animals, have basilar membranes that respond to higher frequencies than yours will. The dog's hearing is no sharper than yours; it's just keyed to a broader range of sounds. In the animal's wild past, he needed this range to hear the tiny, high-frequency noises made by the movements and breathing of wary prey and stealthy enemies.

You instinctively move your head from side to side when you're not sure where a sound is coming from. Why? Because by turning you let one ear receive the sound waves a fraction of a second sooner than the other. Also, the head casts a "sound shadow," and the waves that have to go around it arrive slightly weaker than those that don't. Your brain detects these slight differences in timing and strength and knows in an instant the direction of the sound.

You don't have to turn your head if the source of sound is moving: As the angle of its sound waves shift, it locates itself for you.

You hear also through the bones in your head. That's why you may be surprised when you listen to a recording of your own voice. While you are speaking or singing, you hear not only the sound waves you create in the air about you, but also the vibrations—inaudible to others—that are carried to your ears by your skull. The recording catches only the *airborne* sound waves.

How about tangled sounds—where do we get our amazing ability to sort them out? Every time we hear music we take this trick for granted—but *how* does your ear know one instrument from another when they are playing the same note?

Suppose a pianist and a violinist have just played middle C together. This musical note always has the same fundamental frequency—261 sound waves, or cycles, per second. But the sound waves set in motion when the note is struck on a piano are not exactly like the sound waves generated when it is played on a violin.

This is true partly because the instru-

[Continued on page 252]

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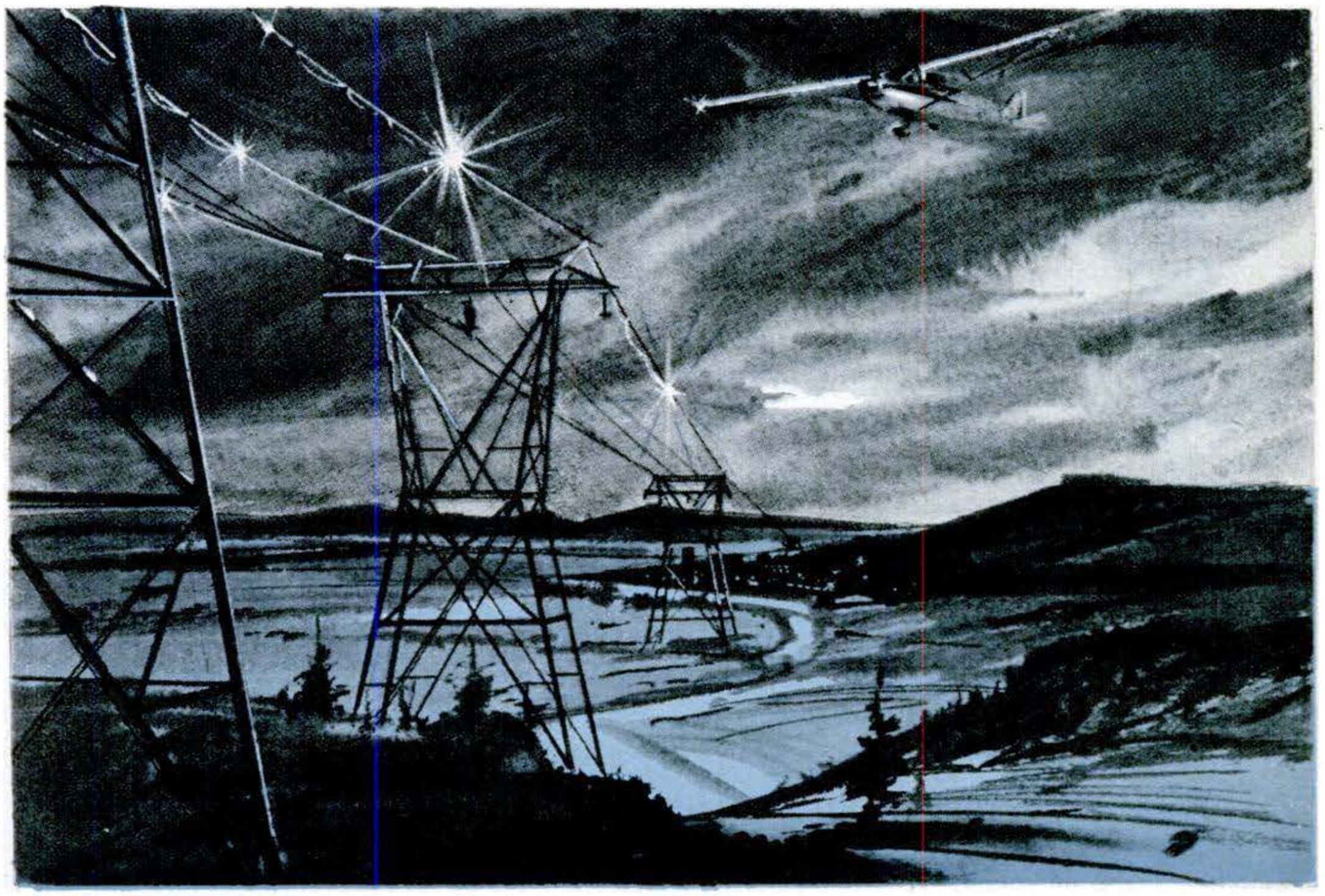
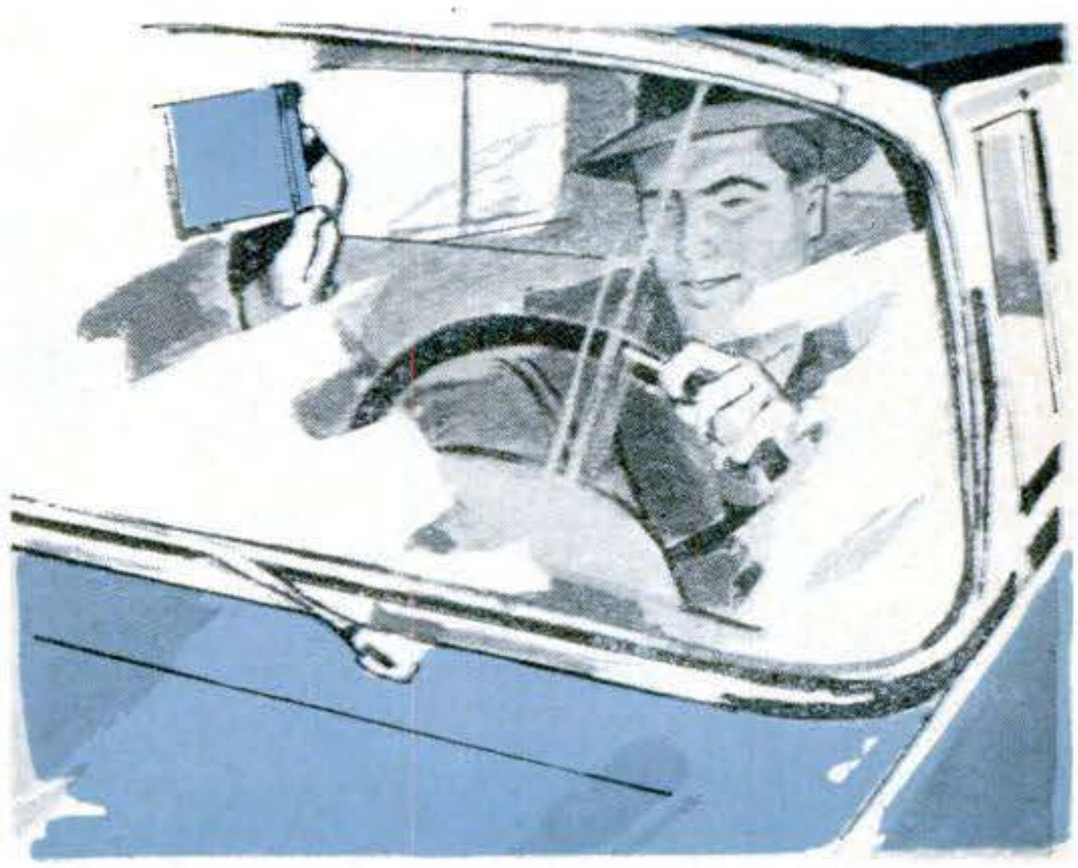
New Ideas from the Inventors



1 Lights Warn Fliers Away. Low-flying planes would be protected from power lines if neon lights were spotted on the cables where towers were far apart. Self-propelled trolleys would shuttle lamp cages along the lines and clamp them in place. A transformer in each of the recently patented units would draw power.

2 Angled Brush Paints Corners. You could paint angled surfaces faster and better with this sloping-bristle brush. A sliding mechanism would open or close a V slot at the tip, forming a notch to cover both faces of an outside corner, or a pointed tip for painting inside corners.

3 Magnet De-Ices Windshield. To remove ice that resists an ordinary windshield wiper, this inventor would mount a hardened scraper blade in a magnetic case. Placed on the outside of the glass, the scraper would do its job as you moved a guiding magnet inside.



Please turn the page for more new ideas

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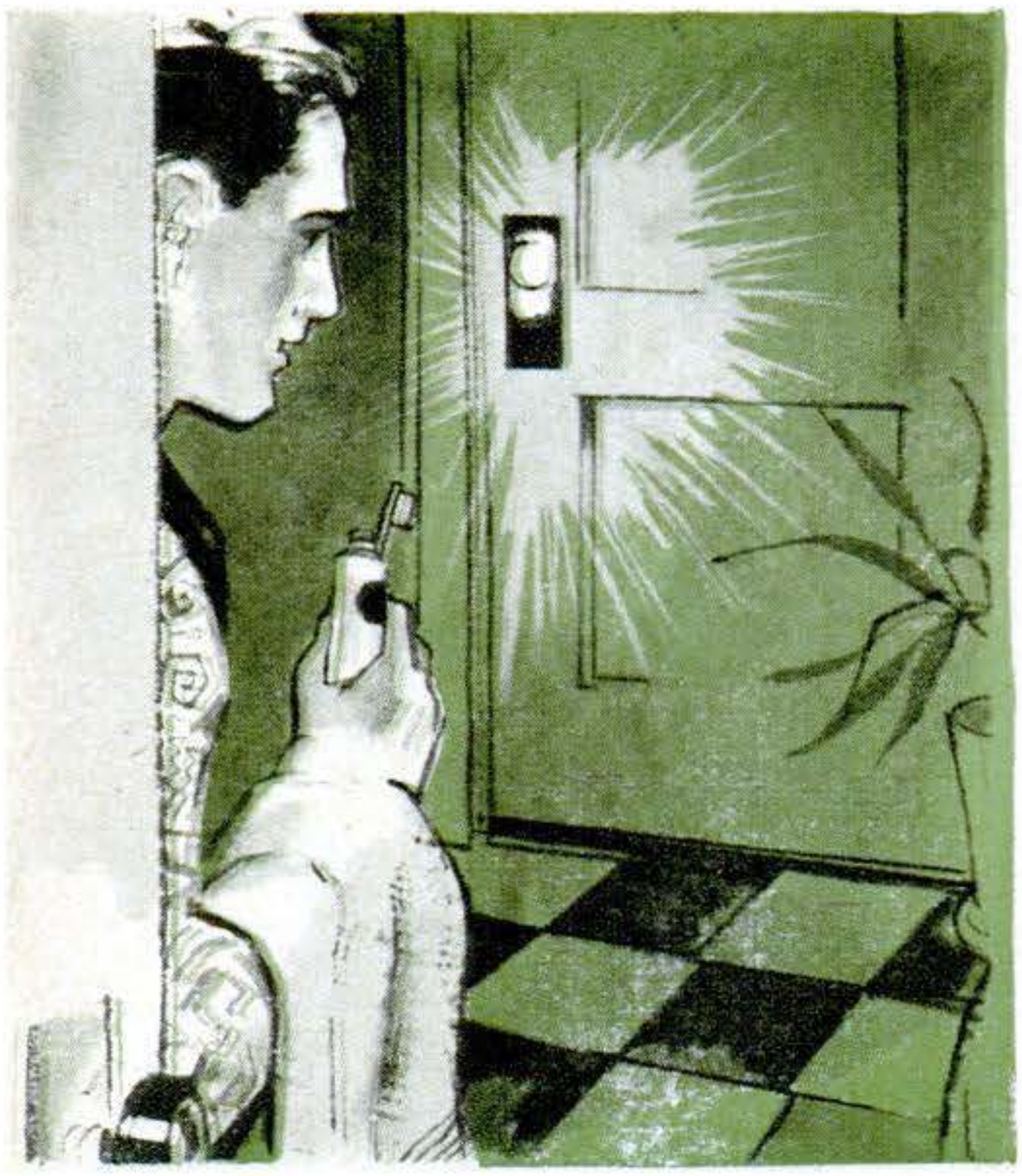
More Inventors' Ideas



4 Knob Shows Light Outside. You could tell from a distance when a bath or other common room was occupied if the door had an indicator like this. Some plastics channel light rays, so a suitable knob (or a disk in the panel) would glow when a light was on inside.

5 Toaster Adjusts Slot Width. A pop-up toaster that followed this GE patent would brown muffins, rolls or buns as well as ordinary bread slices. The slot guard and center element would be slide-mounted to permit the two narrow openings to be changed into one wide one.

6 Newsboy's Gun "Fires" Papers. Formed something like a torpedo tube, this spring-powered gun would hurl a rolled-up newspaper across the width of most lawns. The gun—which is said to provide accurate aim—is designed to help a bike-mounted delivery boy cover his route faster and with less pitching effort.

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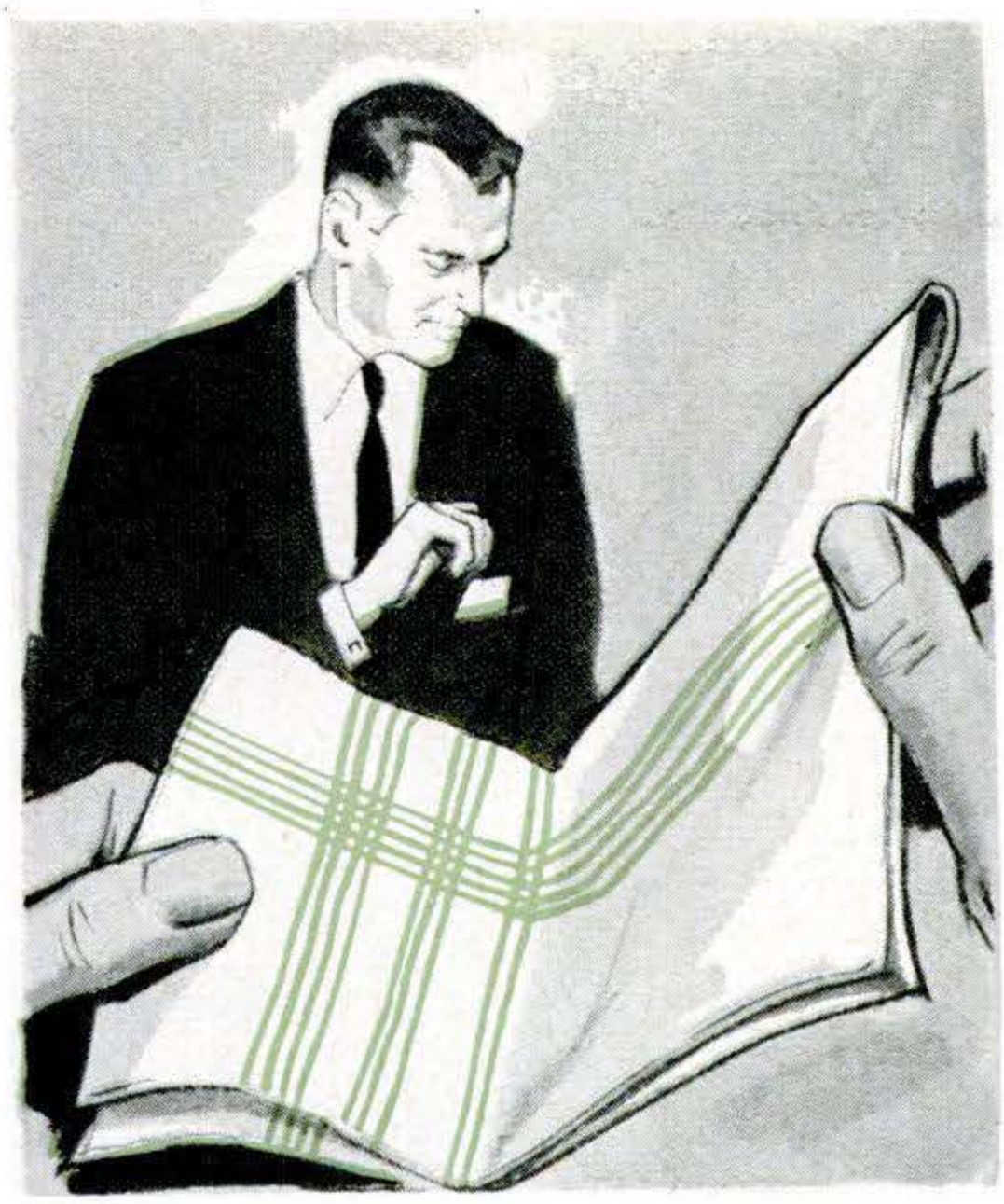

7 Stripes Show Proper Folds. Printed lines on this handkerchief would help you fold it to the right size and shape for breast-pocket display. The correct folding order would be indicated by the number of parallel stripes; unfolded, the lines would form a conventional design.

8 Tie Clasp Holds Key. It would be hard to misplace—or to forget—a key you could wear on your tie. This one would be cut from a special blank, then tab-fastened to a matching spring-gripper. Once the two halves were assembled, the key would form the decorative front bar of an otherwise standard tie clasp.

9 Credit Card Unlocks Pump. You could buy gasoline at any hour at a station that used a credit system like this. To unlock an unattended pump, you'd insert a metal charge plate. Notches in the plate would identify your account so you could be billed later for the sale.

The following patents *have been issued on these inventions: 1. Patent No. 2,736,001 to H. J. Dana, Pullman, J. D. Fogelquist, Richland, and R. O. Ohlson, Rockford, Wash.; 2. No. 2,736,051 to B. Boodakian, NYC; 3. No. 2,707,298 to W. H. Wiest, Jr., Chicago; 4. No. 2,796,039 to E. T. Brave, Los Angeles; 5. No. 2,788,734 to W. R. Weeks, Louisville, Ky.; 6. No. 2,777,436 to R. H. Renner, Noblesville, Ind.; 7. No. 2,735,098 to J. M. Gindi, Brooklyn; 8. No. 2,737,698 to J. D. Falk, Leominster, Mass.; 9. No. 2,792,148 to J. L. Goldenberg, Los Angeles.*

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D.C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

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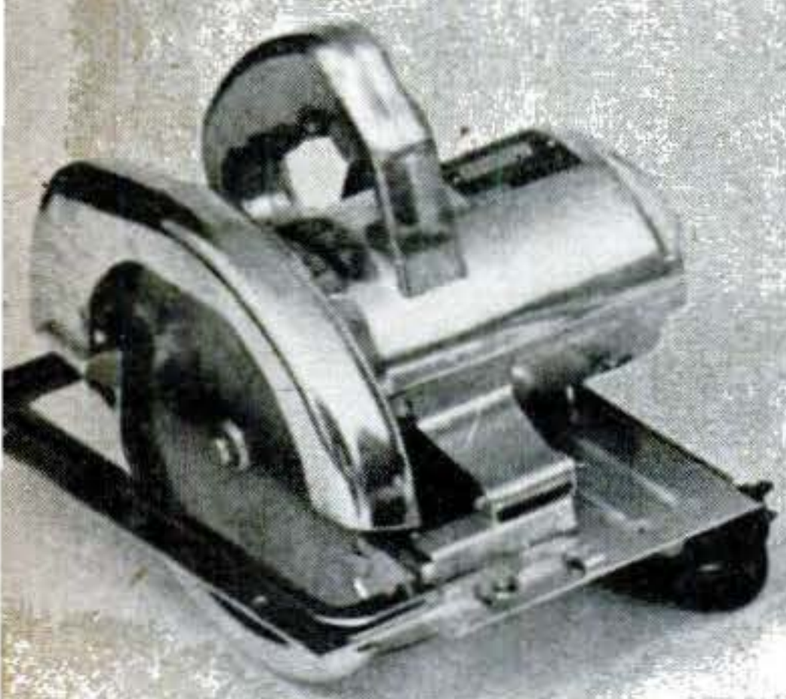
How to Choose a Portable Saw

Consumer News

Look-alikes aren't work-alikes. Here are the facts to help you choose wisely



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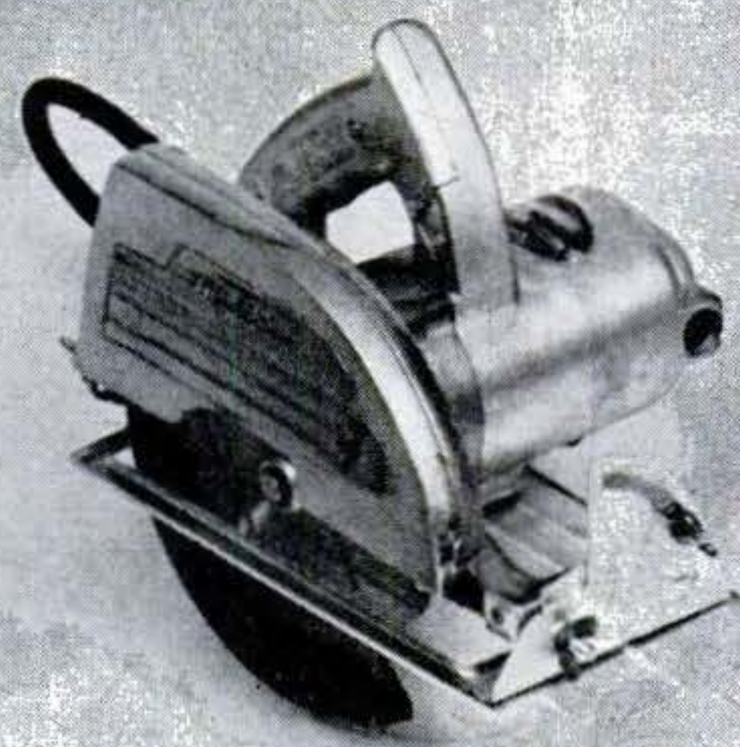
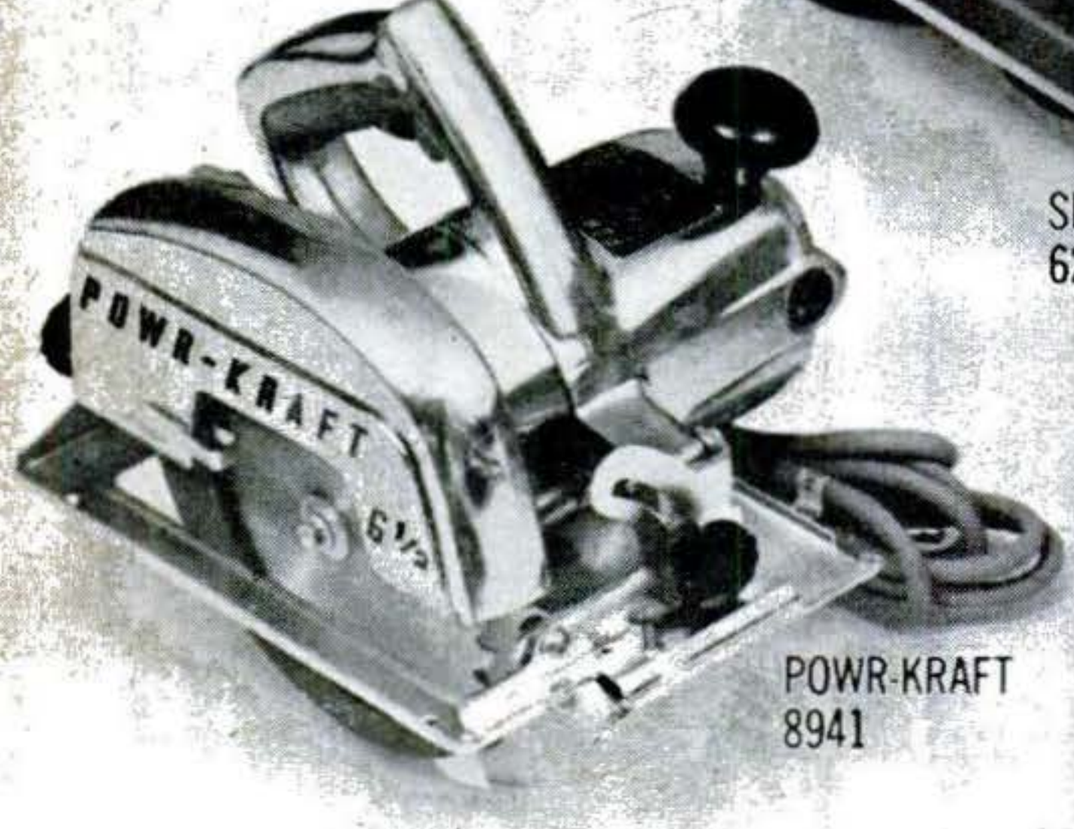
SHOPMATE
620

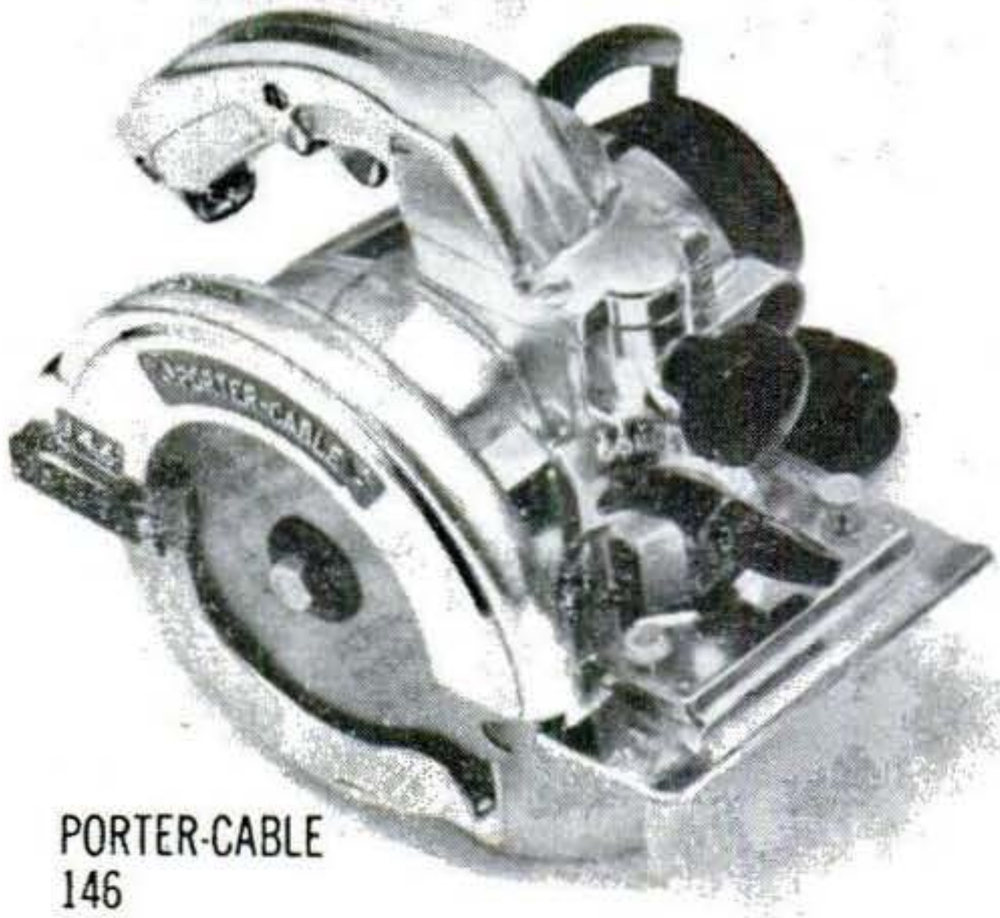


MALL 71



POWR-KRAFT
8941

MILLERS FALLS
800



PORTER-CABLE
146

MILWAUKEE
650

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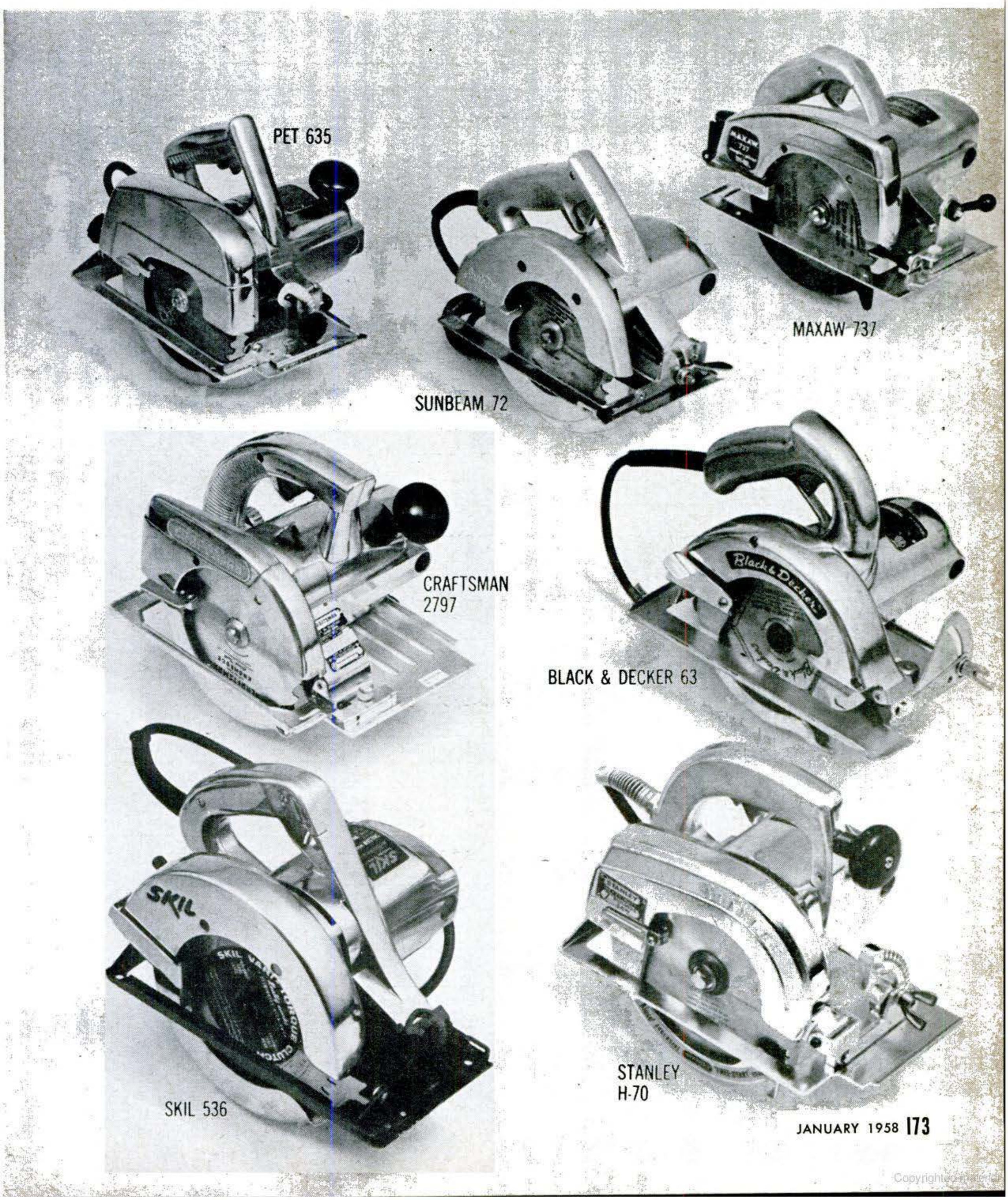
By Ralph Treves

THE big problem in picking a portable circular saw is that these bright, shiny, wonderfully intricate tools all tend to look pretty much alike. There's a temptation to grab the first one you see, or the one with the lowest price tag, or the one that the store clerk glibly tells you is the "most powerful." The facts about portable saws are startling:

- Did you know, for instance, that saw makers are currently in hot debate over the use of the slip clutch?
- That two saws with the same size blade may not give you the same depth of cut?
- That *actual* power may have nothing



How Portable Saws Compare

MAKE	MODEL	RETAIL PRICE		BLADE SIZE (in.)	DEPTH OF CUT (in.)		WEIGHT (lb.)	SPEED, NO LOAD (R.P.M.)	RATED AMPERAGE	TYPE OF BEARINGS	SLIP CLUTCH	CORD GAUGE	BRUSHES ACCESSIBLE FROM OUTSIDE
		Saw	Table		At 90°	At 45°							
BLACK & DECKER	63	$70	$40	6-1/2	2-5/32	1-7/8	11	5,500	10	sealed ball	no	16	yes
	73	$90	$40	7-1/4	2-7/16	2	13-1/4	4,700	11	sealed ball	no	16	yes
CUMMINS (Maxaw)	717	$50	$40	6-3/8	2-1/8	1-7/8	10-1/4	5,500	7	sleeve	yes	18	yes
	737	$60	$40	6-3/8	2-1/8	1-7/8	10-1/2	5,500	7	sealed ball	yes	18	yes
	757	$70	$40	6-3/8	2-1/8	1-7/8	10-3/4	5,500	10	sealed ball	yes	16	yes
MALL	65A	$35	none	6-1/2	2-1/16	1-3/4	7	4,000	5	sleeve	no	14	yes
	71	$60	$33	7	2-3/8	1-15/16	8-3/4	5,000	8.4	sleeve & ball	no	12	yes
	72	$75	$33	7	2-3/8	1-15/16	8-3/4	5,000	8.4	ball	no	12	yes
McGRAW-EDISON (Manning-Bowman and Power House)	1055	$40	$15	7	2-3/8	2-1/32	10-1/2	5,400	8	sleeve	no	18	no
	1055A	$43	$15	7	2-3/8	2-1/32	10-1/2	5,400	8	sleeve	no*	18	no
	256	$50	$15	7-1/4	2-1/2	2-1/8	10-1/2	5,500	8	ball	no*	18	no
MILLERS FALLS	626	$55	none	6-1/2	2-3/16	1-3/4	9-1/2	5,000	8	ball	no	18	yes
	747	$85	none	7-1/4	2-3/8	2	12-1/2	5,500	10	ball	no	18	yes
MILWAUKEE	650	$70	none	6-1/2	2-5/32	1-3/4	12-1/2	6,800	10	ball	no	16	yes
	700	$80	none	7	2-13/32	1-15/16	12-3/4	5,000	10	ball	no	16	yes
MONTGOMERY WARD (Powr-Kraft)	8940	$35	$12	6	2-1/8	1-3/4	11	4,700	7	sleeve	yes	18	yes
	8941	$47	$12	6-1/2	2-1/4	1-7/8	11	4,700	7.25	ball	yes	18	yes
PIONEER (Pincor and Blue Diamond)	575A	$38	$9	5-7/16	1-11/16	1-7/16	6-1/2	4,000	5	sleeve	no	n.a.	yes
	575M	n.a.	$9	5-7/16	1-11/16	1-7/16	6-1/2	4,000	5	sleeve	no	n.a.	yes
PORTABLE ELECTRIC (Pet and Shopmate)	620	$49	$15	6-1/4	2-1/8	1-3/4	11-1/2	4,700	7	sleeve	yes	n.a.	yes
	630	$50	$15	6-1/2	2-1/4	1-7/8	10-1/2	4,800	7.25	sleeve & ball	yes	n.a.	yes
PORTER-CABLE	160	$60	$42	6-1/2	2-5/32	1-5/8	8-1/2	5,000	9	sleeve & ball	yes	16	yes
	146	$70	$42	6-1/2	2-3/32	1-5/8	11	5,900	9	ball	yes	16	yes
	115	$80	$42	7	2-5/16	1-3/4	12-1/2	5,500	10	ball	yes	16	yes
SEARS-ROEBUCK (Craftsman)	2797	$35	$19	5-1/2	1-25/32	1-33/64	7	4,500	6	sleeve	no	18	yes
	2790	$40	$19	6-1/2	2	1-7/8	13	4,600	8	sleeve	yes	18	yes
	2796	$49	$19	6-1/2	2	1-7/8	13	4,600	8	ball	yes	18	yes
SKIL	536	$55	none	6-1/2	2-3/16	1-3/4	9-1/2	6,300	8	sleeve	yes	18	yes
	552	$70	$43	6-1/2	2-3/16	1-3/4	11	6,100	10	ball	yes	18	yes
	553	$90	$45	7-1/4	2-3/8	1-7/8	13-1/4	6,000	11	ball	yes	16	yes
STANLEY	H-65	$60	none	6-1/4	2	1-1/2	11-3/4	5,200	8.5	ball	yes	18	yes
	H-68	$65	none	6-5/8	2-3/16	1-5/8	12	5,200	8.5	ball	yes	18	yes
	H-70	$75	none	7	2-3/8	1-3/4	12-1/4	5,200	9.5	ball	yes	18	yes
SUNBEAM	72	$59	$38	6-1/2	2-1/8	1-3/4	10	6,000	9	sleeve & ball	no	16	yes
	73	$60	$38	6-1/2	2-1/8	1-3/4	10	6,000	9	sleeve & ball	no	16	yes
THOR	450	$50	none	6-1/2	2-5/16	1-11/16	10-1/2	5,500	9	ball	no	n.a.	yes
	475	$65	none	7-1/4	2-7/16	1-3/4	14-1/2	5,400	12	sealed ball	no	n.a.	yes

NOTES: n.a. This information not available. *Due in new models.

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to do with the *rated* power of the saw?

These are just a few of the factors that affect the choice of a good portable saw. As you look closely through the glitter you'll find other important differences. Some are the result of honest differences in opinion; others represent cost-saving.

Picking the size. This is the first thing to watch for. Saw size is specified by diameter of the blade, but what you really want to know is the thickness of stock that the tool will cut.

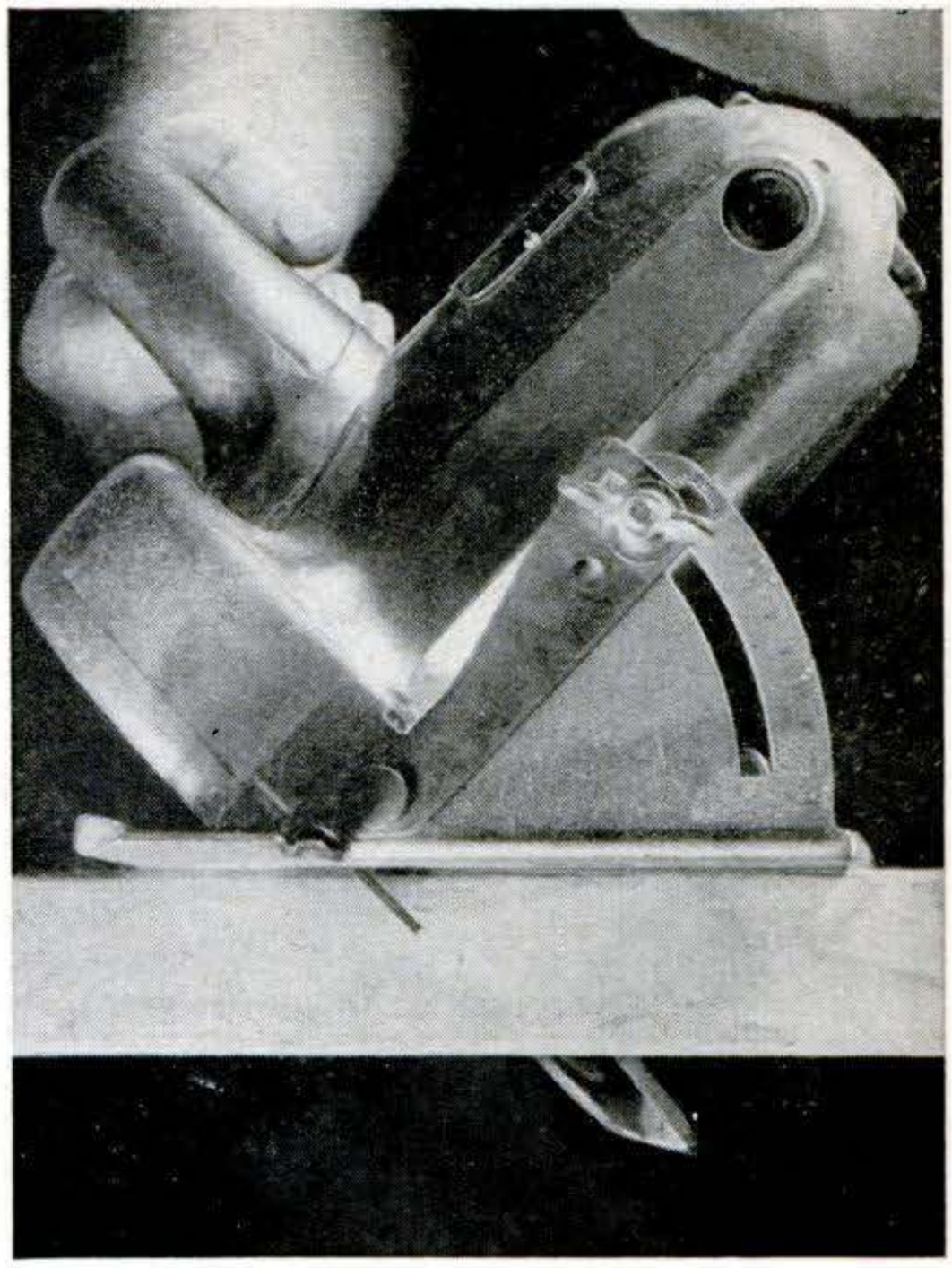
The heaviest stock you are likely to use is 2″ lumber (2x3, 2x4, 2x8). The saw should handle this stock on both straight and 45-degree cuts. Some saws are rated for a depth of cut sufficient for dressed 2″ stock—1⅝″. But there's a hitch: When the blade is sharpened, its diameter becomes smaller and the depth of cut is reduced. Also, the saw labors excessively when the blade doesn't extend beyond the stock thickness.

By far the best-selling models are the 6½″ size. These easily make straight cuts through 2″ stock, and most models will also cut fully through at a 45-degree angle. If you use a lot of lumber in its larger rough-sawn size, you may want a 7″ saw. This size is also desirable for use with an accessory saw table since there is some loss of cutting depth in the mounting.

Saws larger than 7½″ tend to be used by professionals, and usually are heavier and much more expensive.

How powerful is it? Most saws have their rated amperage, or current draw, stamped on the motor name plate. But since not all saws operate at the same efficiency or power factor, you should be leery of making any judgments based on amperage alone. A low-ampere saw could seem underpowered, yet actually be more efficient than a higher-powered model. A few manufacturers state power in terms of torque or horsepower, but these, too, are variable figures.

Blade speed is stated in r.p.m. without load. It can be an indication of cutting speed, but only if you know how the saw behaves under load. In general, the faster-running saws develop more horsepower and thus cut faster *provided they actually run at high speed in use.* A fast saw that slows down under load may not cut as quickly as a slower-rated saw that doesn't bog down. You'll also find that small-diameter blades should turn somewhat faster than larger blades in order to maintain the same cutting rate.



DEPTH OF CUT, not blade size alone, is key to cutting capacity. This 7¼″ saw easily slices through 2″ stock at 45° angle. So will most saws down to 6″. Smaller saws probably won't.

The most meaningful way to judge saw power is by actual trial, which you can usually arrange. A good saw with a sharp blade should move at a brisk pace without slowing down or stalling.

Do you want a blade clutch? The slip clutch, which lets the motor shaft keep turning when the blade binds or jams, is the newest feature on many makes of saws—and also a subject of considerable controversy. Its aim is to protect the motor from burning out under overload and to prevent kickback of the blade.

In standard design, the blade is squeezed between two washers, which tend to lock it firmly to the shaft as the retaining nut spins up tight. But in the new clutches, the outer washer is keyed to the shaft so that it can't turn. This keeps the nut from drawing up tight. You ease tension on the blade enough so that if it jams the motor won't stall.

More than half of the saw makers already provide a clutch, and more are planning to include one on upcoming models. At least two major manufacturers —Milwaukee and Black & Decker—be-

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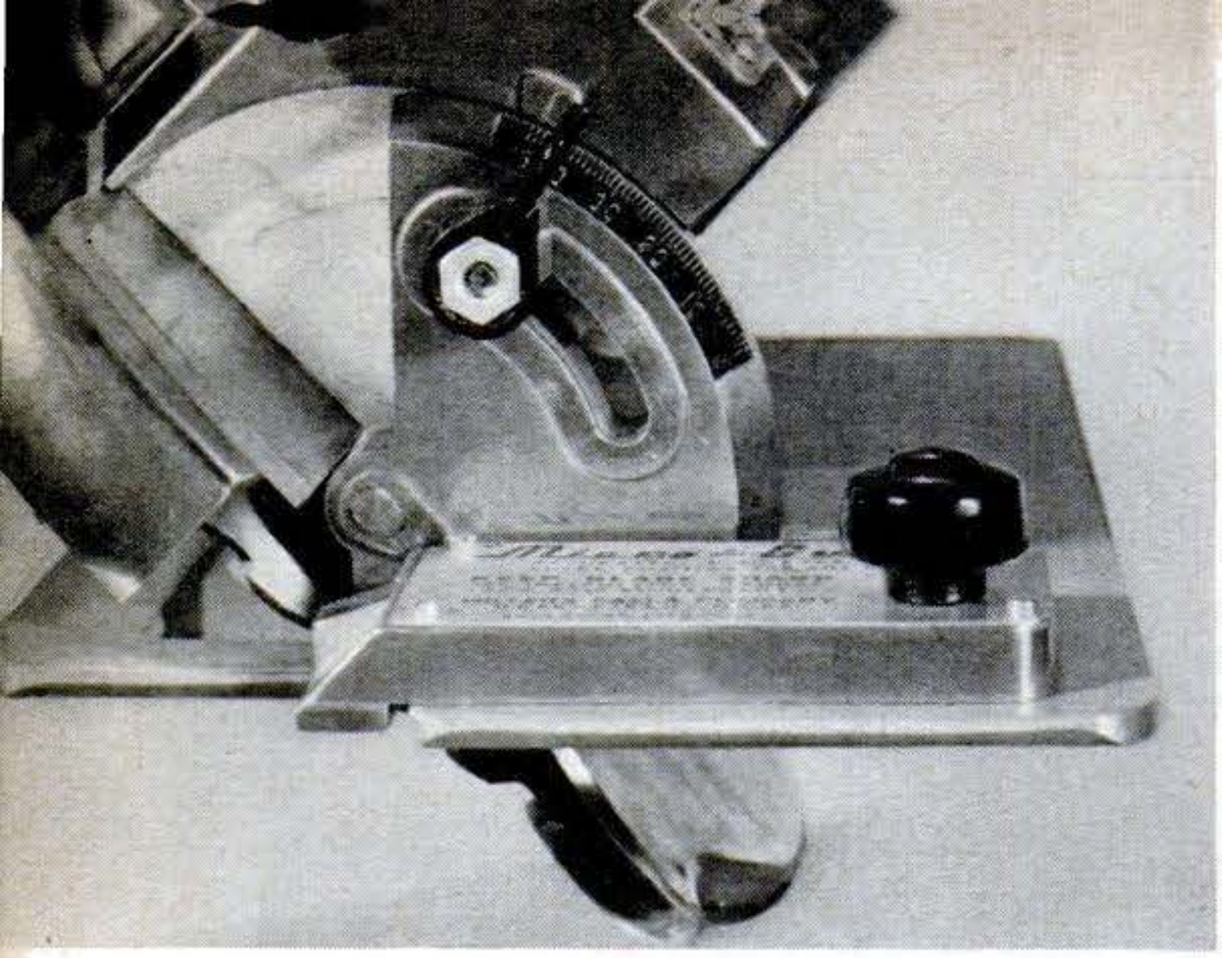

AUTOMATIC CUTTING GUIDE is one of many improvements in portable saws that you'll be seeing. When you set the saw for angle cuts, you don't have to guess where the cutting line is. A sliding guide linked to the motor housing follows the blade as the saw is tilted, showing the correct cutting line at any angle between 45° and 90°. The guide is currently available on this 8¼" Millers Falls model.

little the clutch. They argue that because the adjustment is variable, tension may be set so loose that the blade slips without doing any work or that it may be set so tight the clutch doesn't work at all.

Black & Decker, well regarded in the trade, states its case this way: "The safe saw is one that cuts through the wood quickly and smoothly. A slipping blade makes the job harder in the kind of work most likely to induce kickback. The best protection against trouble is a sharp blade, ample tool power and constant alertness."

Those who favor the slip clutch counter with this argument: It's there if you want it; if you don't, as in rough work such as ripping green lumber, you simply lock the blade tight so it won't slip.

Not all clutches are the same. A few manufacturers have climbed on the "safety clutch" band wagon merely by changing the shape of the holes in their washers from round to oval and filing the drive shaft flat so that the washers can't turn. This may or may not prevent costly wear of the shaft as the motor spins while the blade stands still.

In most slip clutches, the blade rides on a flange on one of the washers, not directly on the shaft itself. As the washer wears, it is inexpensively replaced. Or the blade may ride on a free-turning bushing, also easily replaced.

Manufacturers who supply blades with specially shaped arbor holes use an adapter bushing that fits the blade but still lets it turn on the shaft. Many saw makers, such as Black & Decker, Skil, Millers Falls, Stanley, and Milwaukee, have a complete line of blades designed to give the greatest cutting efficiency with their particular saws. That's the main reason for the specially shaped holes: so you'll be sure to use the correct blade with each make of saw.

Weight may be a tip-off. You want two opposite things in the weight of a saw: It must be light enough for easy handling, yet heavy enough to indicate rugged construction. In general, the heavier saws have larger motor windings and sturdier casings—two good points. A good solid weight also helps to hold the saw in the cut and minimizes kickback. A light saw may tend to be a bit bouncy.

[Continued on page 262]

Six features to look for in a portable circular saw

1. *Depth of cut:* This should be sufficient to handle at least 2" stock on both straight and 45° cuts.
2. *Motor power:* Don't go by amperage alone. Saw should cut quickly, smoothly, without slowing down.
3. *Slip clutch:* If saw has one, it should work reliably and have protection against wear; if there is none, the saw must have sufficient power to overcome jamming.
4. *Weight and balance:* Buy the heaviest saw you can handle, but be sure it feels comfortable on the work, not just in your hand.
5. *Base plate:* See that it's free from wobble when locked and has easy-to-set depth and angle adjustments.
6. *Blades:* Make sure you can get a variety of types to fit the saw.

STARTING NEXT MONTH: A fact-packed series of articles to help you buy or build a home wisely. Want to know how to match a house to your income? You'll find a bedrock formula in the opener: "How Much Can You Pay for a House?" Read it in February PS.

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You Can Make Any Bracket Now

THE steel brackets you see above are a brand-new series of shapes, now available for the first time at hardware stores. There are just four basic types, and three sizes of each, yet you can assemble endless combinations—something like an "adult Erector set"—to suit any need you have.

The "alphabet" brackets are shaped like a Z, C, L or A. The smallest are about 1″ high, the middle size 2″ high and the tallest 4″ high. The holes take 3/16″ bolts or rivets and No. 9 wood screws.

By joining different brackets, you can make up your own stands, racks, motor mounts, drawer hangers, hinges or swivels and many others to the exact shape and size you need. The Handi-Brackets, made by Merit Products Co., Cincinnati, are sold in packages of two or four for 59 to 79 cents.

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what's new

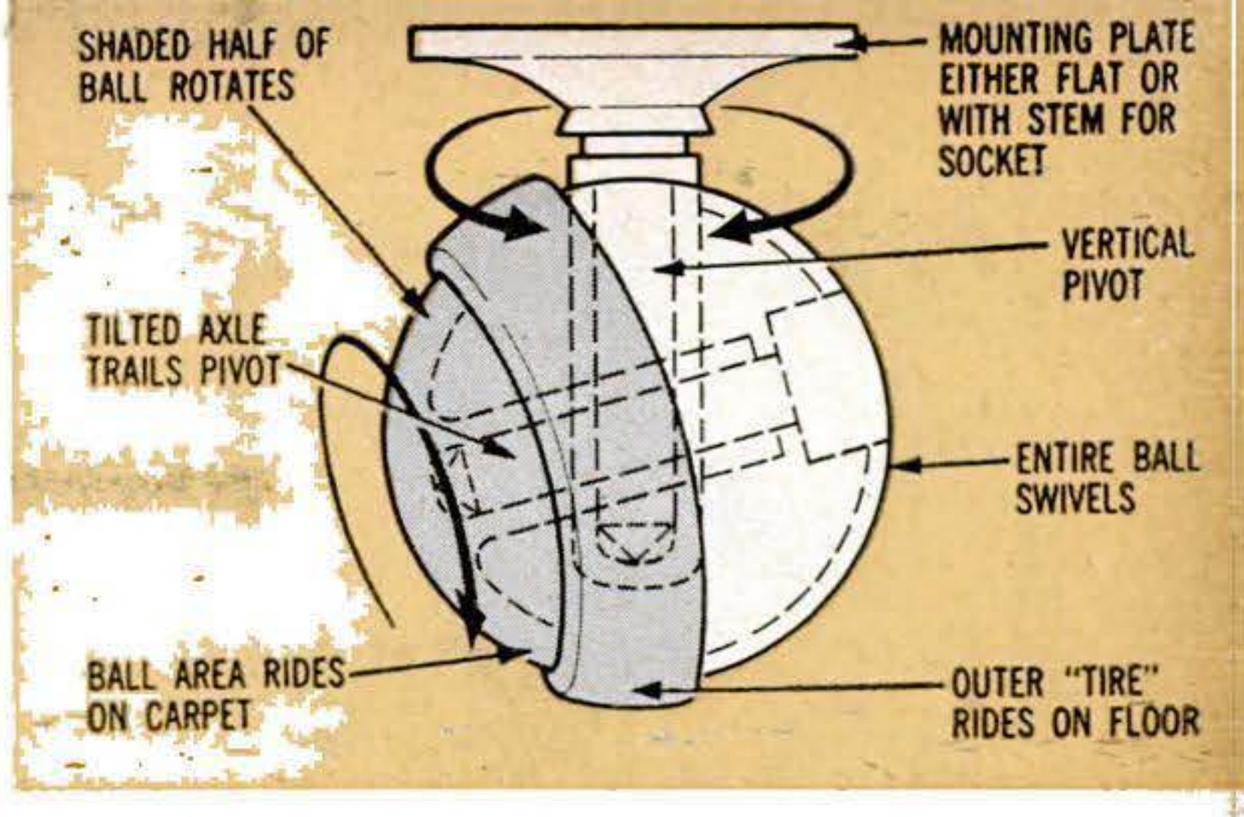
for your home

The woodiest-looking wood-flake panels yet to hit the market use actual shavings bonded into 1/4″-thick sheets. The large flakes, shown full-size on this page, have a rough-textured, three-dimensional appearance that hides joints and nailheads in wall paneling and built-ins. Result: low cost (about 20 cents a square foot) and a way to salvage waste wood. Tenex is a mixture of light and dark woods, comes in 4′-by-8′ sheets. A similar type, Flakewood, is available in maple, cedar, pine or fir.

Midget heat pumps, reported on in PS last month, are back in the news—this time as a ***portable heater-cooler*** you can carry from room to room. Turned one way in a window, the $150 Carrier heat pump warms in winter; reversed, it's an air conditioner in summer; placed on the floor, it becomes a dehumidifier . . . ***Baseboard heaters with built-in electrical outlets*** eliminate conventional in-the-wall wiring, making them easy to install in either old or new construction. The radiant electric heaters, made by General Alliance, come in 2′, 4′, 6′ and 8′ lengths, which are simply fitted together against the wall . . . There's also good news for homeowners who heat with hot air: ***a germ-killing ultraviolet lamp,*** 2½ times more powerful than previous types, that can be inserted in a heating or air-conditioning duct. A single Westinghouse lamp is said to kill 80 percent of airborne virus and bacteria.

Self-tuning TV sets go another step in easing the life of the knob-hating viewer. On new Zenith and Westinghouse sets you won't have to fiddle with the fine-tuning control after warm-ups and channel changes. Both makes employ automatic tuners, made by Standard Coil Products, that eliminate the culprit: "oscillator drift." . . . To muffle a TV or radio set when the phone rings, there's an ***automatic volume control*** called the Sound Husher that attaches to the phone cradle. Lift up the receiver and the sound level drops, but others can still listen . . . For the wife who has *almost* everything: ***an electric can opener.*** The Sleepy Hollow opener shuts off automatically, has a magnet to hold the lid, also sharpens knives. Fancy price, too: $27.95 . . . Frigidaire has borrowed the double-boiler idea for broiling in Imperial ranges. Water in bottom of ***double-decker pan*** keeps grease fluid, high walls catch oven spatter . . . Latest use for pressurized dispenser cans is a ***home fire alarm.*** Whenever heat reaches 135°, pressure is released,

giving off a shrill blast from a whistle. It's made by Astoria Mfg. Co. . . ***New ball-shaped casters*** are spruced up for a modern look and super-smooth operation. One-half of the ball rotates, as at right, providing a broad bearing area that won't bog down in deep-pile carpets. On hard surfaces, only the outer ring touches, reducing friction. The Shepherd casters come in several metallic finishes, cost about $8 for four.



for the home handyman

A sure cure for snow shoveling is a ***snow-blower attachment***, shown below, now available to fit Rototiller's ¾-hp. electric power head. This is the same basic power unit that runs a garden tiller, grass trimmer, grinder, drill, circular saw and chainsaw. The blower is driven by a long shaft that spins a paddle wheel inside a scoop, tossing snow 15′ or more away.

Rushing the season a bit, ***power mowers will be easier to start*** this spring. GE makes a ***built-in electric self-starter*** that you just plug in to get a gasoline-powered mower going easily. It will appear on seven makes of mowers this year. Fairbanks-Morse is readying a ***pushbutton starter***, also electric, that you'll be able to install yourself. ***A spring-driven windup starter*** isn't on the market yet, but will be put out by Clinton . . . ***First built-in grass catcher*** for rotary mowers will be offered by Jacobsen. A completely enclosed plastic hopper, it can also be closed off to permit conventional discharge of cuttings for mulching . . . ***A new gridlike guard*** on Choremaster mowers is said to keep toes, but not grass, away from the whirling blade . . . While we're still in the pipe-

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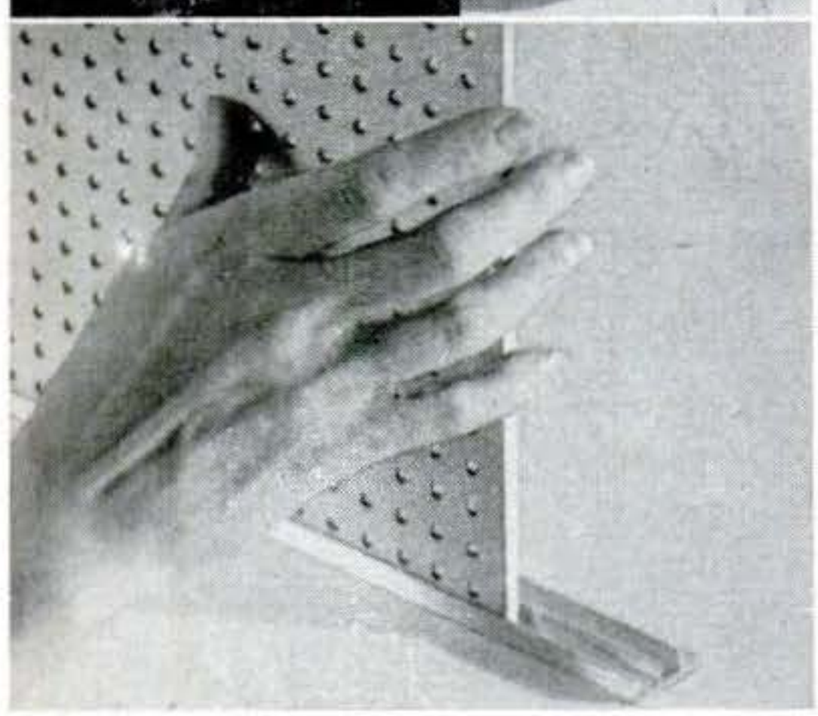
freezing season, there's an ***electrical defrosting tape*** that has its own built-in thermostat. You just wrap Welcraft tape around a pipe, plug it in, and it goes on or off as the temperature dictates . . . ***Floor-waxing attachment*** for ¼″ electric drills, at left, works like professional machines. It has two counter-rotating wheels that keep it from skittering off to one side. Two rotary brushes come with the Black & Decker attachment for applying wax, and there are two buffing pads for polishing. Price: $19.95 . . . Next time your wife asks you to put up curtain rods, you might try ***self-adhesive curtain brackets*** called Selfix. You just moisten the back and stick them up. They're said to hold on metal and chewed-up wood that won't take screws or nails.



Watch your hardware store for ***new aluminum sliding-door tracks*** (at left) just put out by Reynolds. They provide two grooves for either ⅛″- or ¼″-thick doors, can be quickly cut to any length with an ordinary handsaw . . . ***Hard-to-get hardware items,*** usually available only to manufacturers, are now being packaged for retail stores by Presto. The assortment includes luggage handles, chest locks, and hi-fi hardware . . . ***A magnetic door holder,*** by Durabilt, keeps a door from banging the wall, and holds it open, too.

for your car

A special snow-removing windshield wiper is 6″ long, half the length of standard 12″ blades. This is said to double the wiper's pressure against the windshield, clearing off snow that stops most ordinary blades. The Anderson blade can be hooked on quickly in winter, then removed in summer.

You can carpet your car wall-to-wall with Buxbaum's high-pile carpeting or with nylon rugs in five colors, by Goodart. A rubber Hocar mat in any of six colors can be personalized with your name, using a kit of letters that comes with it . . . Any crook who tries to force a window or door on a car fitted with an ***auto burglar alarm*** will set off a loud siren blast and a bright light. The Growler alarm runs on its own batteries, will also warn of fire or a cut wire . . . ***Driveway markers*** patterned after the airport type have thousands of facets in a plastic reflector that shine brightly when car, house or other lights hit them from any direction. The markers, shown at left, are made by Dynamic Specialties, who say that a string will guide you around even a 90° curve in the driveway . . . Bits of rubbish that accumulate on long trips can be dumped in a ***plastic wastebasket*** that hangs from a bracket on the car's dash or sidewall. Made by the All Power Mfg. Co., the Tenite container lifts off the bracket for emptying.

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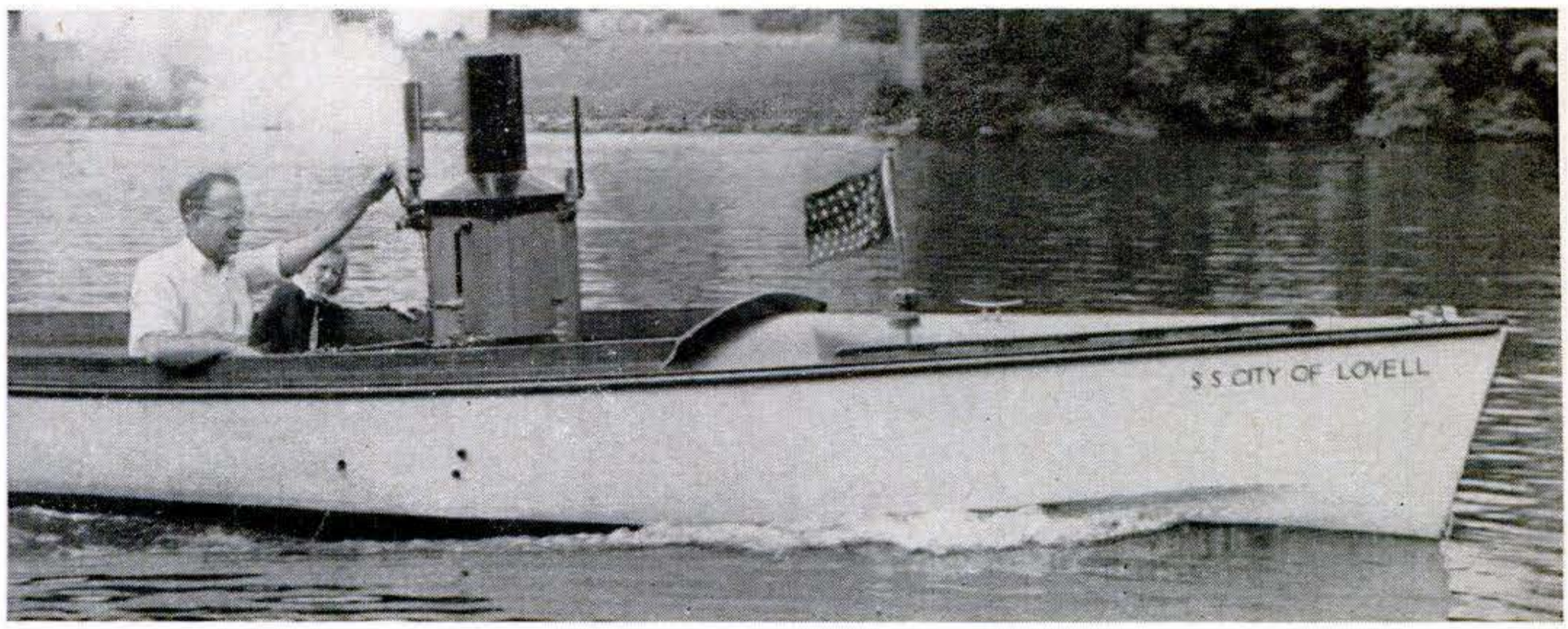
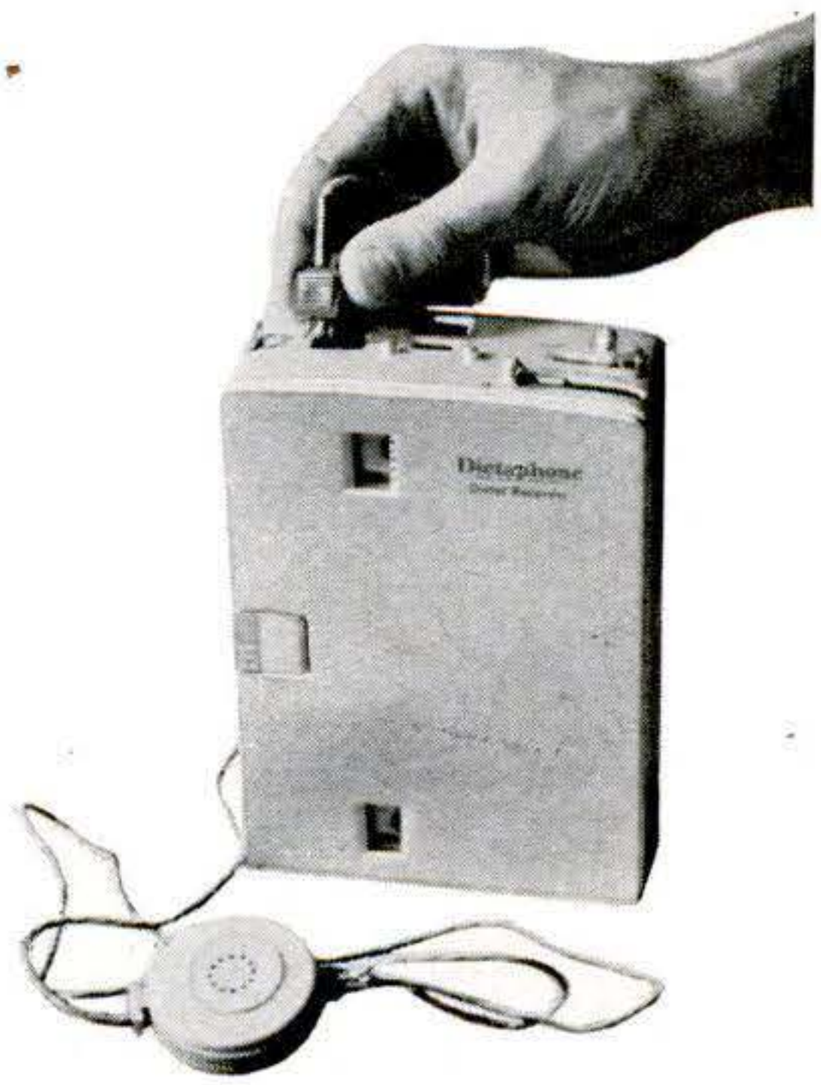
what's new for your leisure hours

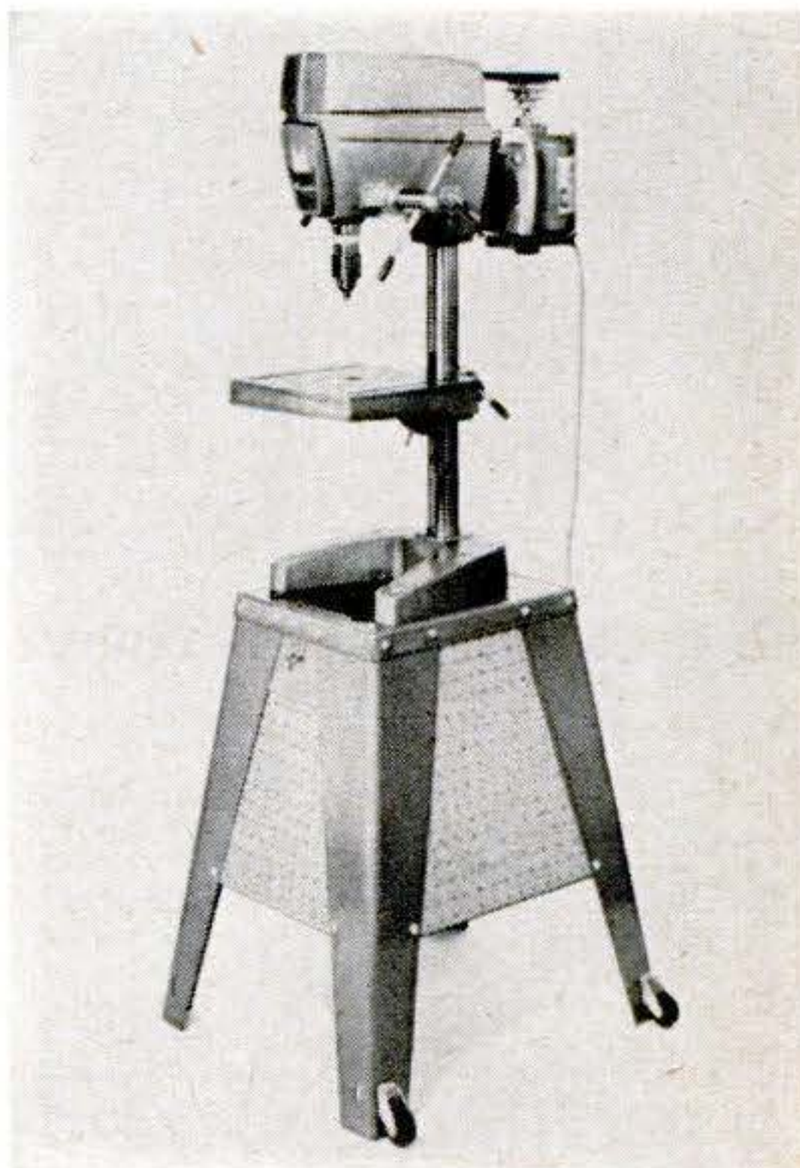


Steamboat lovers can now get their own ***packaged live-steam power plant,*** shown in use above. The five-hp. Semple engine runs under a 185-pound head, chugs up to 10 m.p.h. on 18′ to 25′ hulls, and gets 400 miles to the ton (of soft coal). Cost: $735 . . . For winter fishermen, there's a 3½-hp. ***gasoline-powered ice drill,*** made by Feldman, that bores 28″ deep to reach frozen-over fish.



Tiny tape recorder at right preserves vacation-trip notes and other on-the-spot observations. The 2¾-pound, battery-operated Dictaphone will sell for $294 . . . ***Portable refrigerator*** runs on tiny propane-gas tanks for camping trips, and on electricity for use at home. Two vital facts: It has trays for ice cubes, holds 1½ cases of beer. Bernz-O-Matic will bring it out this spring.

for the home shop



Magna, which introduced its first single-purpose tools just two years ago, now has added ***five new individual tools***—a 12½″ drill press (at right), 30″ lathe, 8″ tilt-arbor saw, 12½″ jigsaw and 4″ belt sander. This brings the total to 12 individual tools being marketed by the makers of the Shopsmith multi-purpose tools. Magna individual tools are similar to those the company makes and Montgomery Ward sells under the Powr-Kraft label. One difference: The Magna drill press has a tilting table and ball bearings. Of the other new Magna tools, the tilt-arbor saw, jigsaw and belt sander are smaller versions of three tools already in the line.

A chainsaw attachment for portable electric saws, first announced in PS last month for the Shopmate line, is now available for Black &

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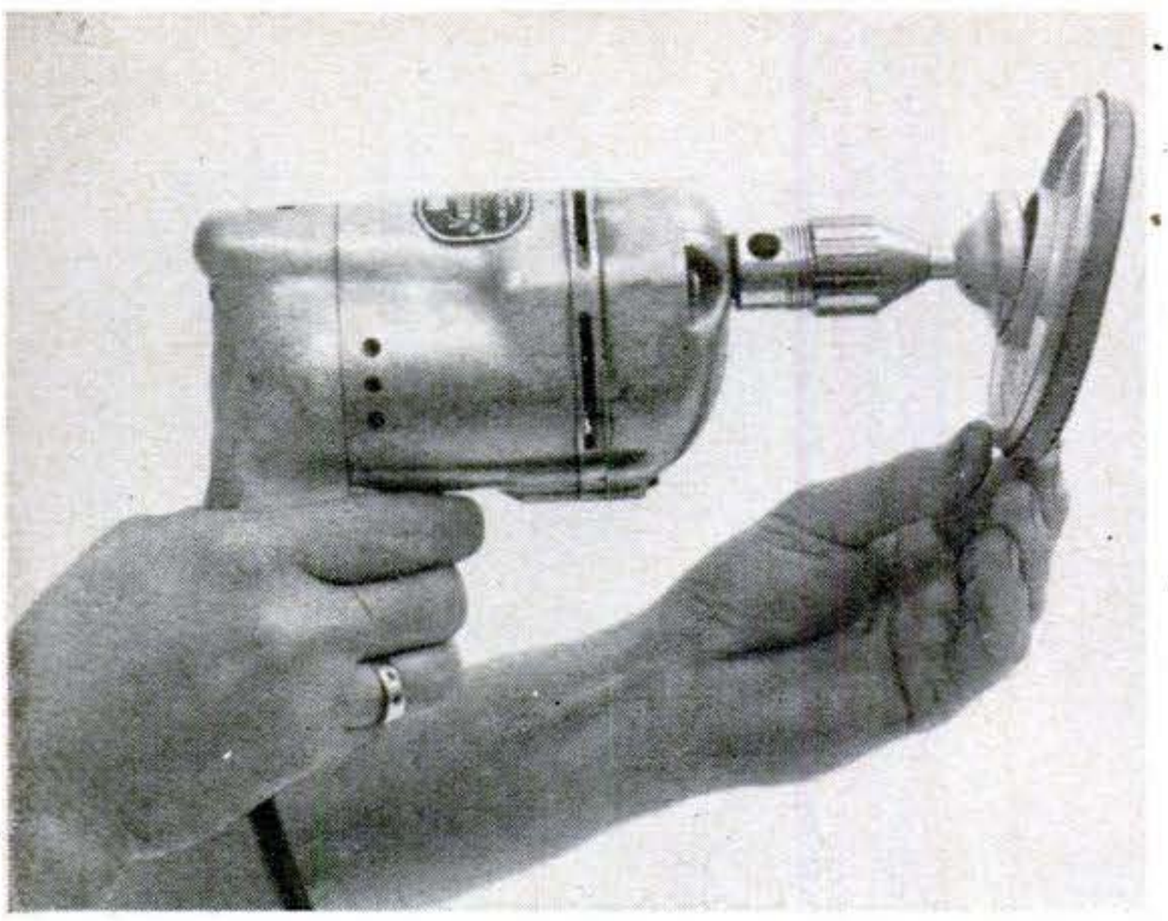
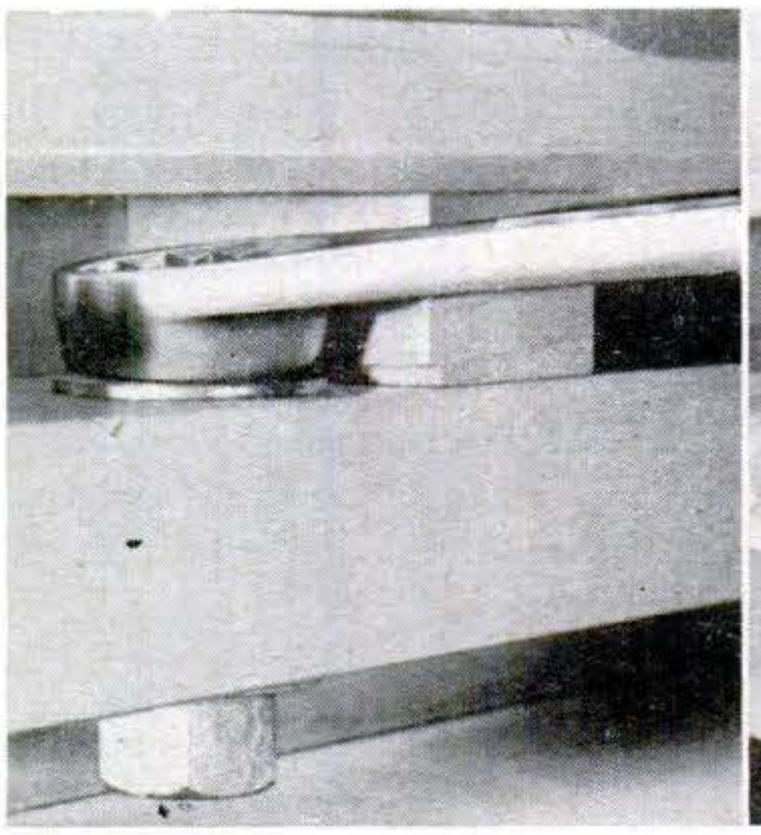
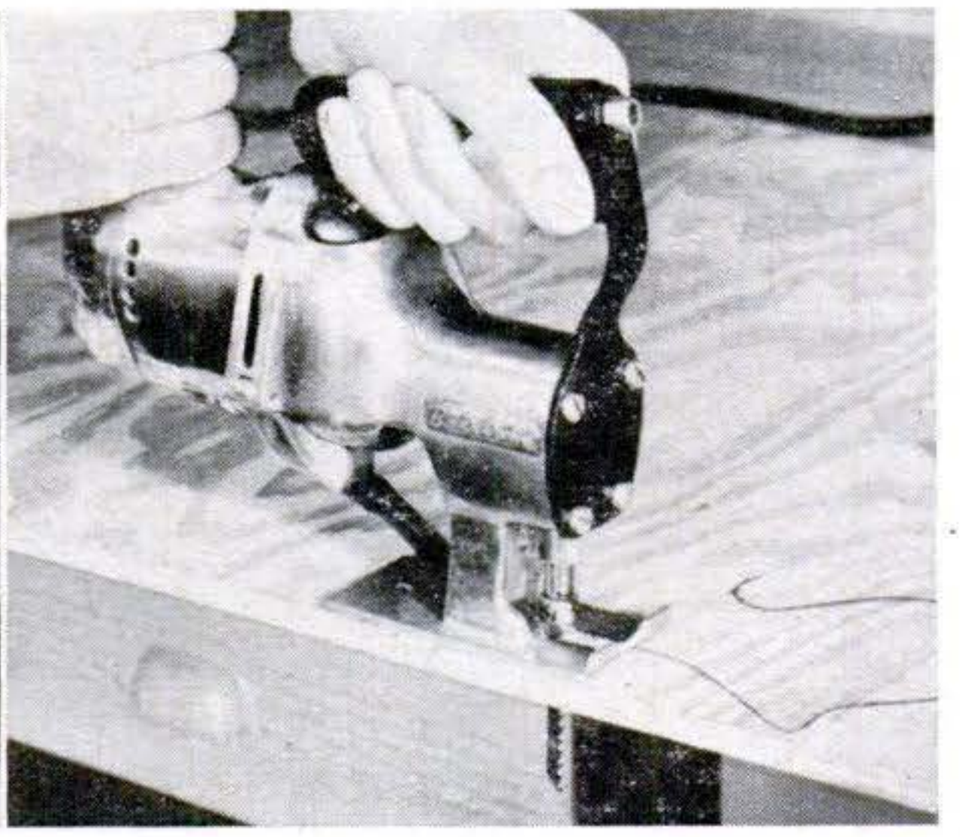


Decker saws. It will cut trees up to 18″ in diameter and sells for about $50. . . ***A rubber mallet head,*** made by W. J. Ruscoe, slips on an ordinary hammer to convert it quickly for use on sheet metal and wood . . . The ***ball-jointed sanding disk*** at left, for ¼″ electric drills, stays flat against the work even if you tilt the drill. The Dola attachment is said to sand faster and eliminate the swirls and gouges made by rigid disks. It sells for $5.95 . . . You can space wall studs quickly with a ***new steel measuring tape*** made by Stanley. It has extra red markers every 16″, plus a retractible pin at the end to hold the tape for you . . . ***New slimmer, flatter wrenches*** (below, left) are said to reach in tight places where conventional S-shaped wrenches won't go. Barcalo makes them . . . Tool attachments are taking on a "built-in" instead of "tacked-on" look. The ***drill-powered jigsaw*** below at right bolts directly to the drill in place of the chuck to provide the smoother, sturdier operation of a single-purpose jigsaw. Black & Decker sells the attachment for $19.95 to fit many of its drill models . . . ***A free movie*** on the use of power tools in the home, produced by Supreme Products (see address list below), is available to local church and business groups.

Sheldon Gallager





for more information:

Here's where to write if you can't get any item listed above: **All Power Mfg. Co.,** *400 Roosevelt Ave., Montebello, Calif.;* **Anderson Co.,** *Gary, Ind.;* **Astoria Mfg. Co.,** *42 Vernon Blvd., Long Island City, N. Y.;* **Barcalo Mfg. Co.,** *Buffalo, N.Y.;* **Bernz-O-Matic,** *Otto Bernz Co., Rochester, N.Y.;* **Black & Decker,** *Towson, Md.;* **Buxbaum Co.,** *Canton, Ohio;* **Carrier Corp.,** *Syracuse, N.Y.;* **Choremaster,** *800 Evans St., Cincinnati 4;* **Clinton Machine Co.,** *Maquoketa, Ia.;* **Dictaphone Corp.,** *420 Lexington Ave., NYC;* **Dola Corp.,** *2635 Durfee Ave., El Monte, Calif.;* **Durabilt Metal Products,** *Union City, N.J.;* **Dynamic Specialties,** *Birmingham, Mich.;* **Fairbanks-Morse,** *Beloit, Wis.;* **Feldmann Eng. & Mfg. Co.,** *Plymouth, Wis.;* **Flakewood,** *Long-Bell Lumber Co., Kansas City, Mo.;* **Frigidaire,** *Dayton;* **General Alliance Corp.,** *2105 Moore St., San Diego, Calif.;* **General Electric,** *Schenectady, N.Y.;* **Goodart Mfg. Co.,** *Silver Spring, Md.;* **Growler Alarm Corp.,** *30 W. 36th St., NYC 18;* **Hocar Mfg. Co.,** *2507 N. Clark St., Chicago;* **Jacobsen Mfg. Co.,** *Racine, Wis.;* **Magna,** *Menlo Park, Calif.;* **Presto Lock Co.,** *Garfield, N.J.;* **Reynolds Metals,** *Louisville, Ky.;* **Rototiller, Inc.,** *Troy, N.Y.;* **Selfix Products,** *Chicago;* **Semple Engine Co.,** *Lovell, Me.;* **Shepherd Casters,** *Benton Harbor, Mich.;* **Sleepy Hollow Gifts,** *Falls Church, Va.;* **Sound Husher,** *Tennessee Valley Development, Inc., Oak Ridge, Tenn.;* **Stanley Tools,** *New Britain, Conn.;* **Supreme Products movie,** *Modern Talking Picture Service, 3 E. 54th St., NYC;* **Tenex,** *Pack River, P. O. Box 1452, Spokane, Wash.;* **Welcraft Products,** *New Carlisle, Ind.;* **Westinghouse,** *Pittsburgh;* **W. J. Ruscoe,** *Akron, Ohio;* **Zenith Radio,** *6001 W. Dickens Ave., Chicago.*

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New 9-Inch Saw Has Deepest Cut

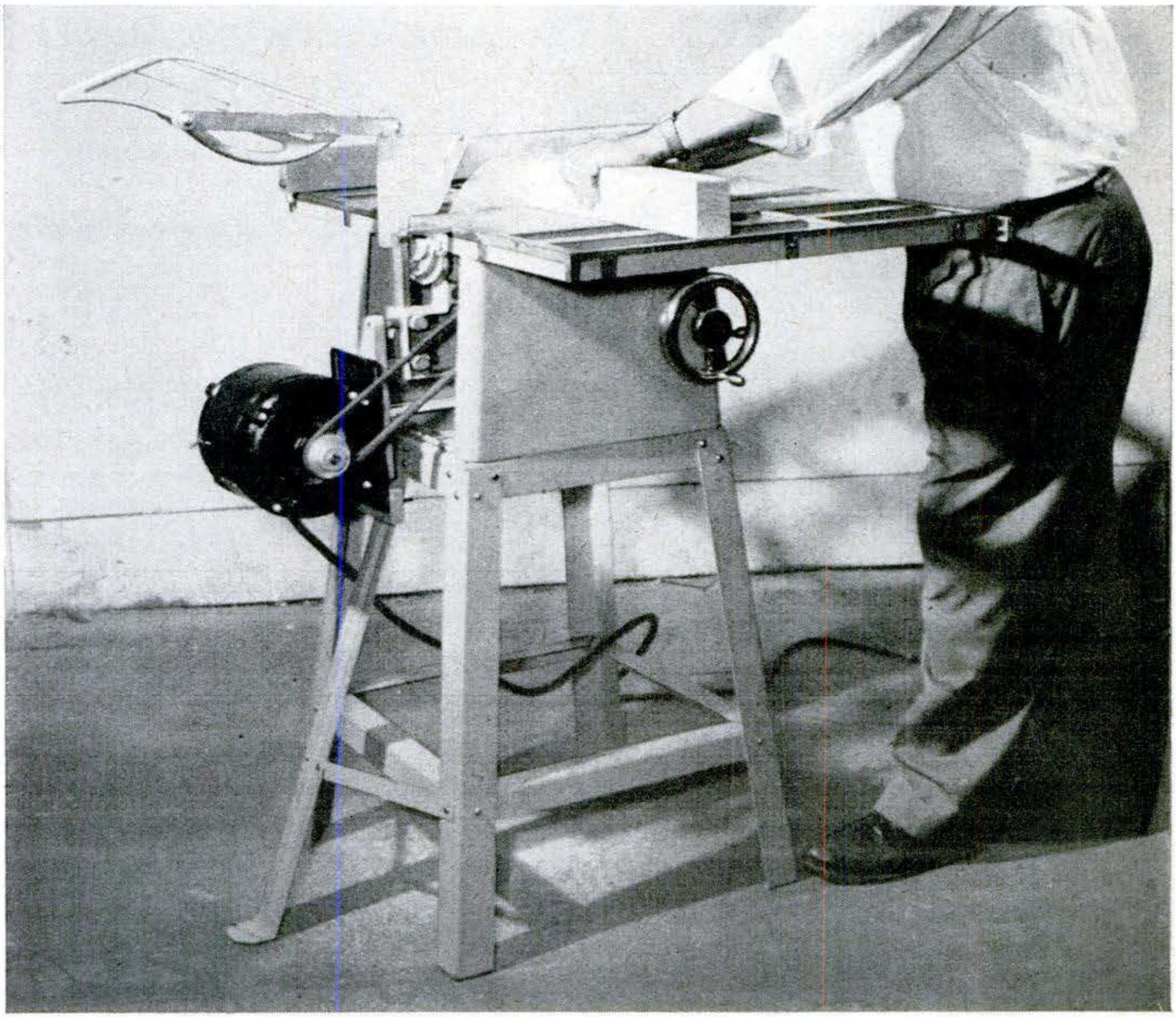
SHREWD engineering by a pair of brothers who once designed tools for the auto industry has given this 9″ table saw a cutting capacity almost equal to that of many 10-inchers. It makes a cut 3¼″ deep.

This is ½″ deeper than one popular 9″ saw and ¼″ greater than the deepest-cutting competitive 9-incher. It is only ⅛″ less than the 3⅜″ cutting depth of the average 10″ saw.

In any table saw, the arbor bearings and their housing, plus the thickness of the saw table, limit the amount of blade that can be raised above the table surface for actual cutting. Recognizing this, Lynn and Harry Sprunger reduced the size of the arbor-support casting, thinned the table above it and cut away the ribs under the table to clear it. This gave them a maximum blade elevation of 3¼″. Result: The saw wastes only 1¼″ of the 4½″ radius of a 9″ blade.

The Sprungers built their first tool, an 8″ tilt-table saw, in 1946 in a small plant. Today, operating as Sprunger Bros., Topeka, Ind., they produce a complete line of woodworking power tools. Each tool is test-run before it leaves the factory.

The 9″ saw shown is priced at $99.95. The stand with a rear outrigger leg to prevent tipping on heavy cuts is extra at $14.95. A table-extension kit consisting of two extensions and a 30″ graduated bar for setting the fence on *either* side of the blade costs $29.85.



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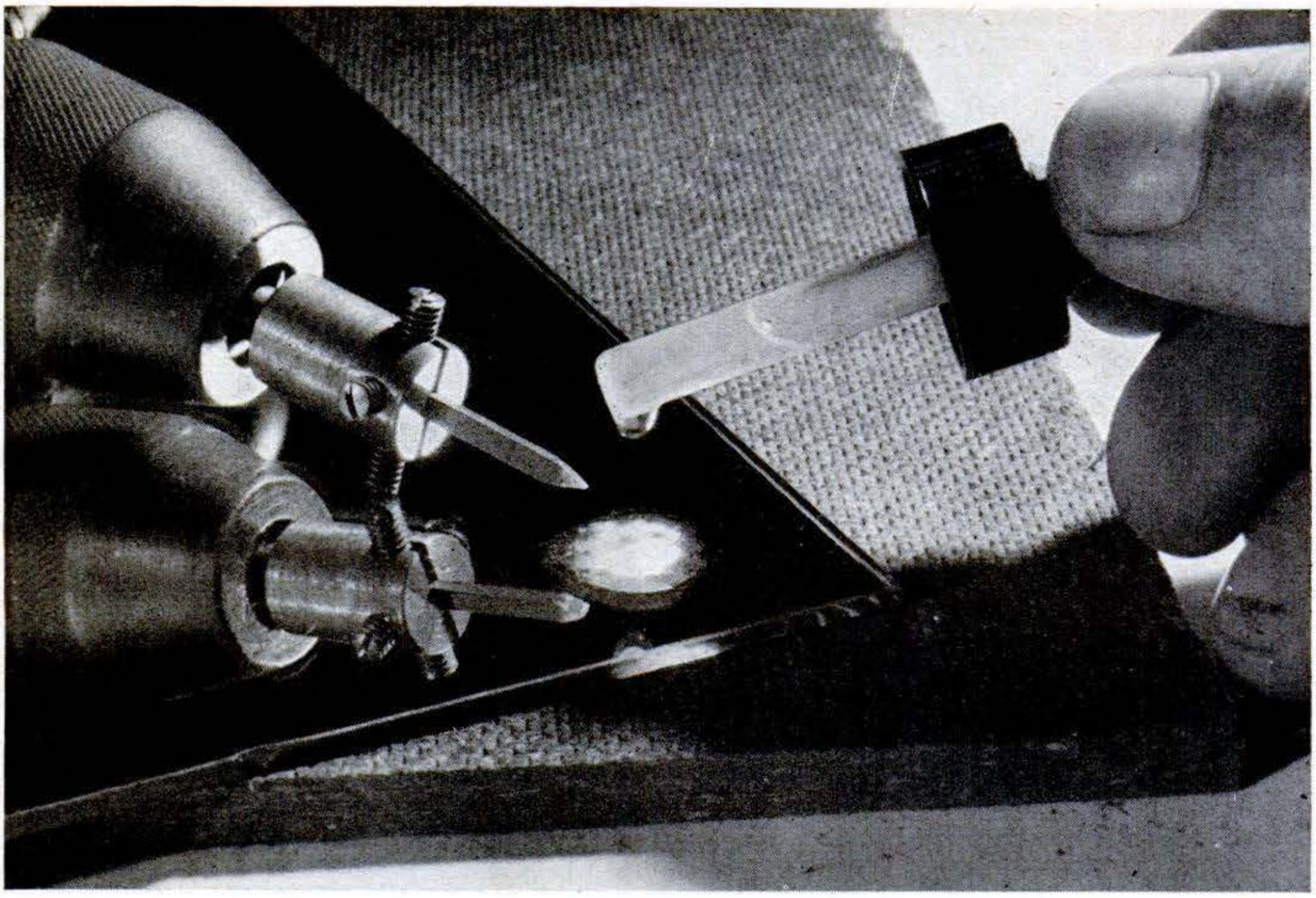

TUNGSTEN-CARBIDE BIT makes short work of drilling a mounting hole in the corner of a mirror. Here, the mirror reflects the image of the bit while turpentine is dropped into partly drilled hole. Special holder for the bit has a ¼″-diameter shank to fit a drill chuck.

Now You Can Drill Glass Like Cheese

NEAT, round holes can now be drilled in glass with almost as little effort as in metal. Best of all, the operation is simple—just chuck the bit in a hand drill.

The bit that does the job has been tested for more than six years by professional glass workers. It is available in six diameters (3/32″ to ½″).

Drilling is done by a specially ground tip of tungsten carbide. The drilling speed must be fairly slow. Use a hand-operated drill, turning the crank at about 100 r.p.m., or use a speed-reducing attachment in an electric drill.

Light pressure is essential. Too much may crack the glass. Mark the hole's location with a grease pencil, put a drop of turpentine on the spot and gently start drilling. If the drill is held vertical, the bit will bite in at the first turn of the handle. If you allow the drill to lean even slightly to one side, the bit will wander. Once the hole is started, continue cranking, stopping occasionally to add turpentine with a brush or eyedropper. When the tip of the bit breaks through, ease up even more on the pressure and keep drilling until the V point completes the hole.

Jars and bottles can be drilled as easily as flat glass. Support them in a wood V block or lightly clamp them between pieces of soft wood.

After drilling, holes can be enlarged with a triangular file. Grind the three edges of the file sharp, dip it in turps, insert it and twist it lightly.

The tungsten-carbide bits are said to drill 900 holes before losing their cutting edge. They can then be returned to the maker for resharpening at 35¢ each.

The bits are available from H. G. Pasternack, 225 Lafayette St., NYC, and cost from $3.90 to $8. A special holder comes with each bit.—*Herb Pfister.*

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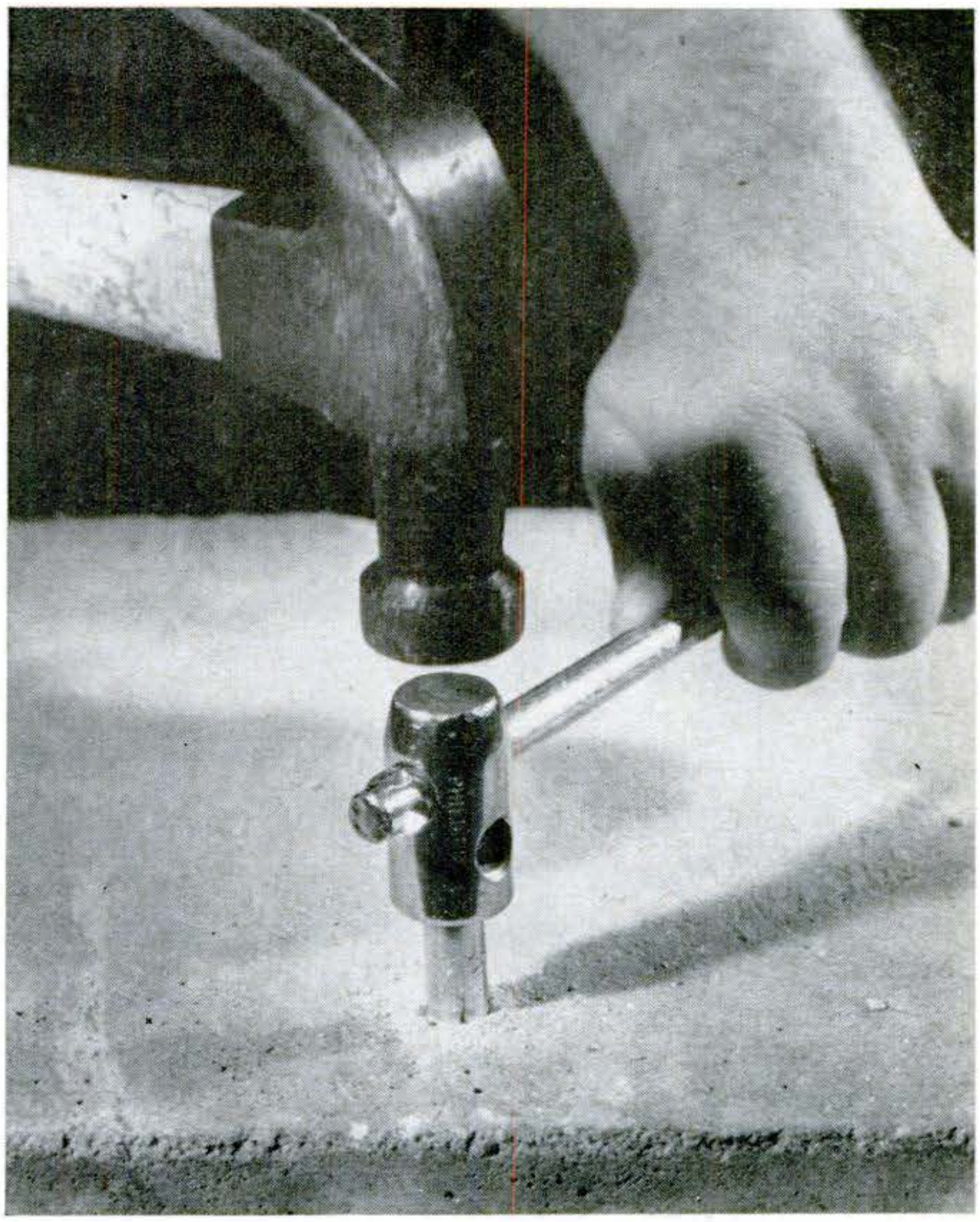
New Concrete Anchor Is Its Own Drill

FASTENING things to concrete can now be almost as easy as driving a nail in wood. The new masonry anchors on this page require no drilling—they drill their own holes. You hammer them in, then screw bolts into threaded holes in the ends. They'll work in brick, blocks, even stone.

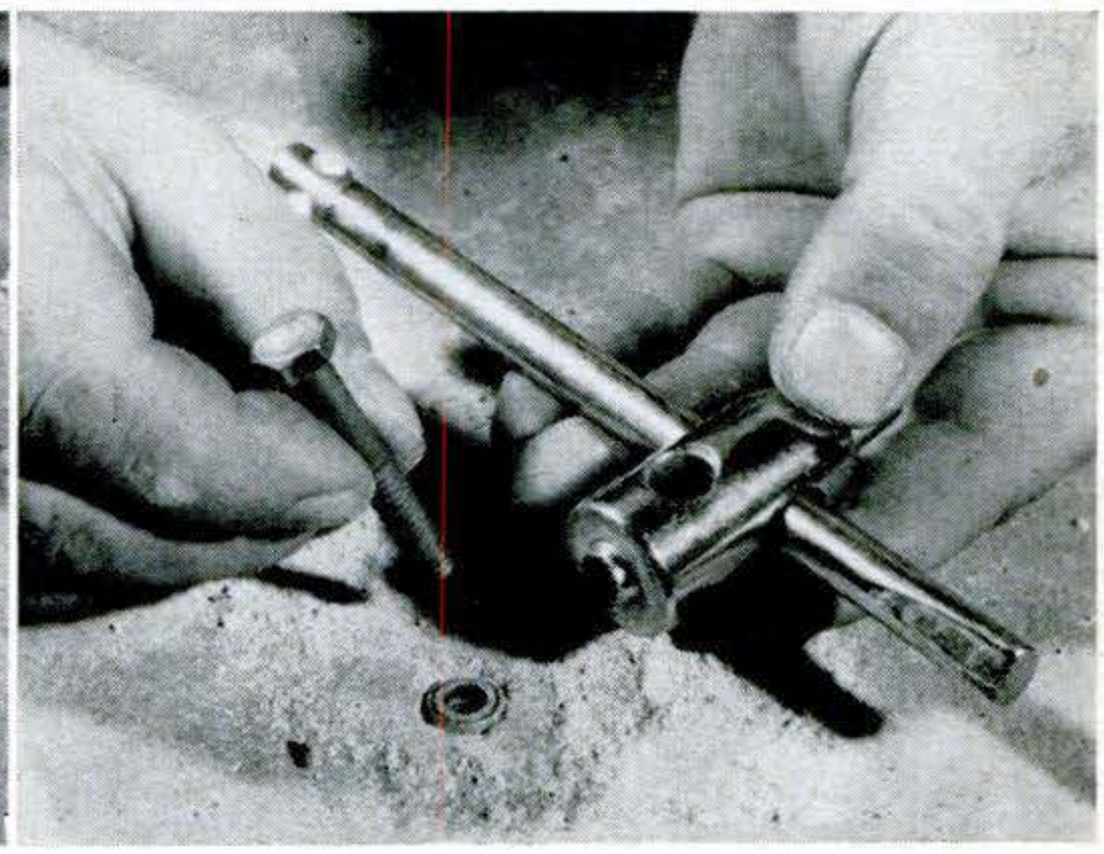
The way the anchors work is ingenious. Each tiny barrel has eight cutting teeth—in effect a built-in drill that's always sharp because you use it only once. After the hole is made. the anchor is withdrawn, a steel expander plug inserted, and the anchor driven back in, locked tight.

The new-type anchors are made of case-hardened steel. Packages of four cost you about 80 cents, and a holder about $1. The anchors take ¼″ bolts and handle most home-fastening jobs. They're made by the Phillips Drill Co., Michigan City, Ind., and their trade name, Red Head, is familiar to the construction industry.



1 SELF-DRILLING ANCHOR is quickly driven into concrete by hammering a small holder that comes with the kit. As the sharp-edged anchor digs in, the holder is swung from side to side to keep the teeth biting into fresh material. The holder automatically stops the anchor at correct depth.

2 AFTER THE HOLE IS DRILLED, you remove the anchor, insert a conical steel plug in the end, and pound the anchor back in. The wedge expands the anchor, locking it in.



3 SHARP RAP AGAINST SIDE of the holder snaps off protruding shank flush, exposing the inner threads. Standard ¼″ bolt can now be screwed into anchor to hold more than a ton.

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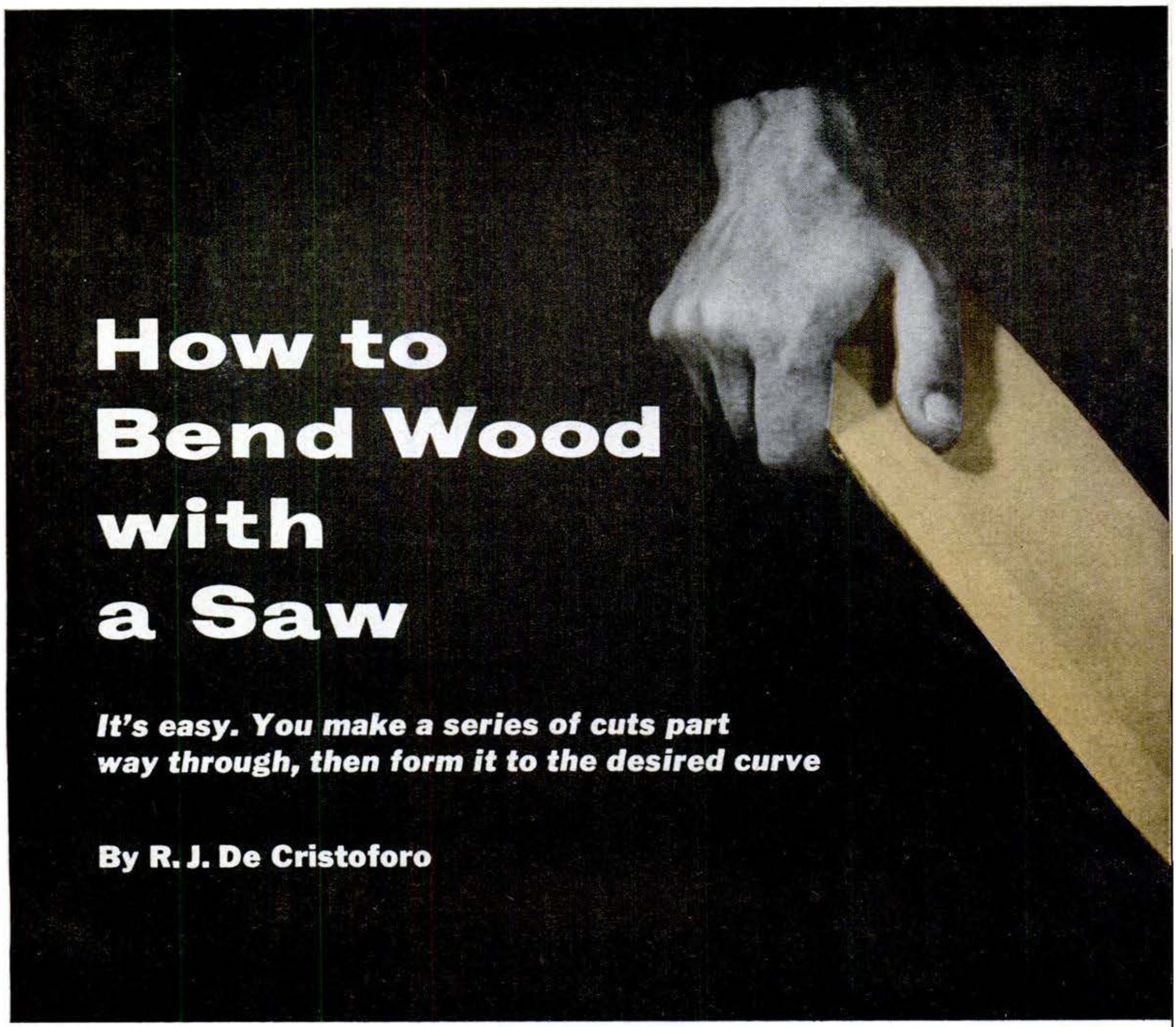

How to Bend Wood with a Saw

It's easy. You make a series of cuts part way through, then form it to the desired curve

By R. J. De Cristoforo

BENDING wood with steam and jigs in the old way is often impractical. This is especially true when you are working with large panels. For these, and any other wood-bending jobs where the full strength of the stock isn't needed, there's another and easier way. It's called "kerf curving."

Professional woodworkers use kerf curving to round off the corners of paneled walls, shape aprons for counters and hollow cores for drum tables, form contoured chair seats and backs, bend trellis tops, and make curved forms for poured concrete. You'll find it equally useful for dozens of indoor and outdoor projects.

What kerf curving is. The trick is to make a number of deep side-by-side cuts in the face of the stock. These will form the underside of the bend. In effect, this turns the opposite face into a flexible veneer at each saw cut, or kerf. At the same time, the material between each pair of kerfs becomes a reinforcing rib. You can also bend the wood so the smooth face is *inside* the curve. Here the kerfs will open up.

How to space kerfs. Naturally, the closer you space the kerfs, the more sharply you can bend the wood. But making too many kerfs wastes time and weakens the stock needlessly. Here's a simple way to find out how far apart the cuts should be for a curve of any given radius:

Make a sample kerf in a scrap of wood of the same type and thickness as the piece you plan to bend. The cut should also be in the same direction, as related to the grain. For maximum strength, saw no deeper than you have to for a bend

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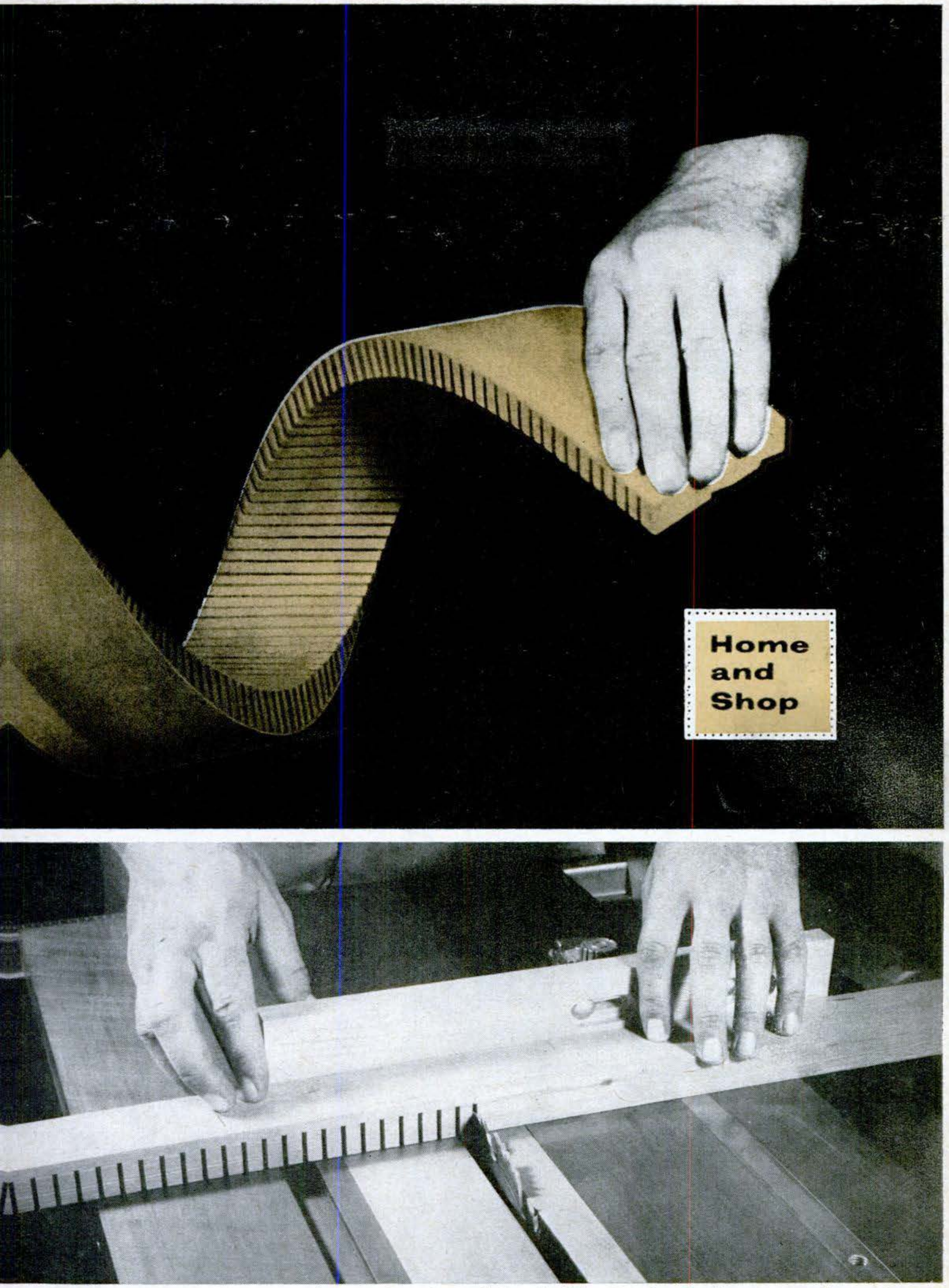

PREPARED FOR BENDING by a series of parallel saw cuts, or kerfs, wood becomes surprisingly flexible. Cutting kerfs at an angle produces a spiral curve like that in the picture at top.

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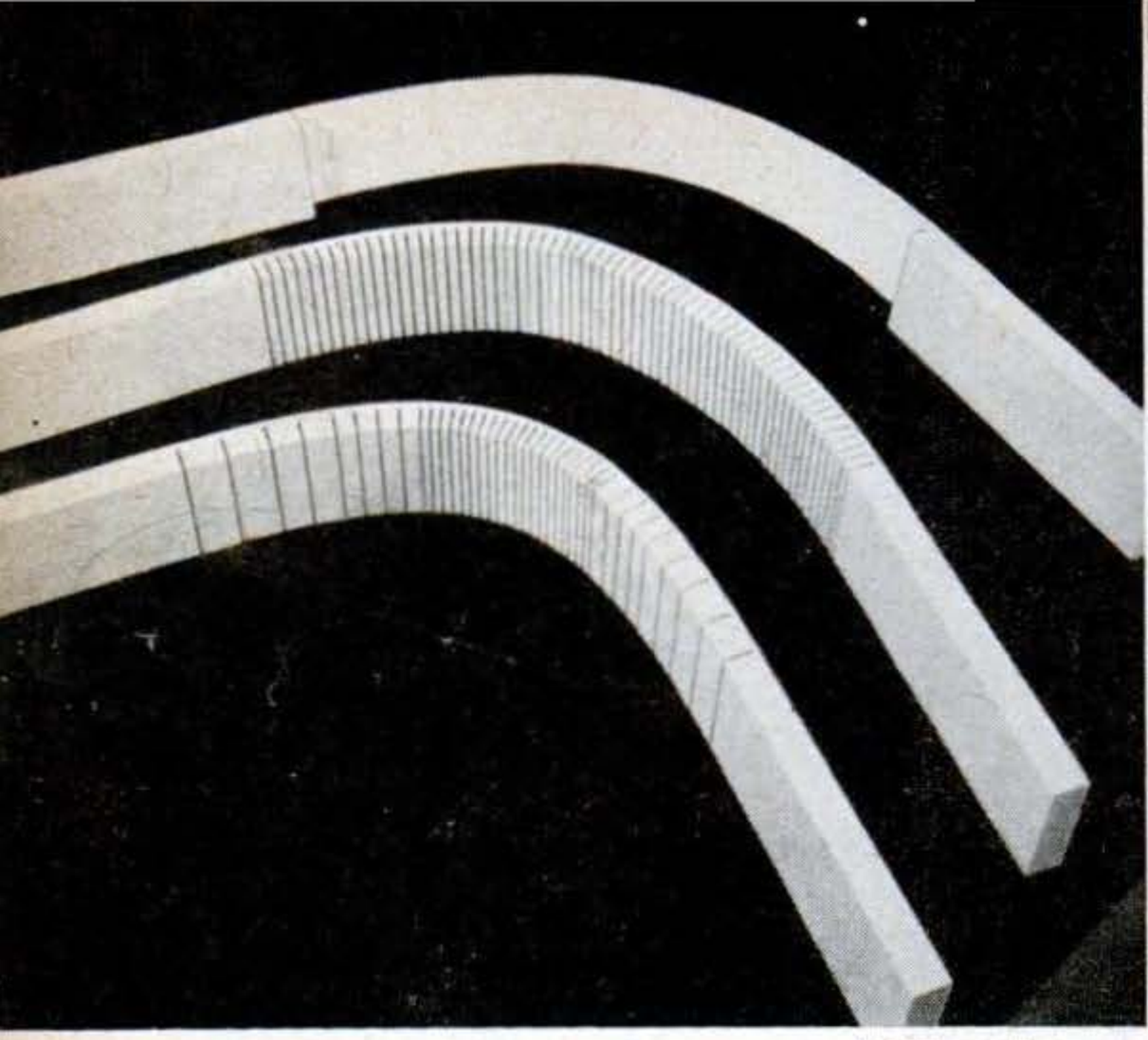
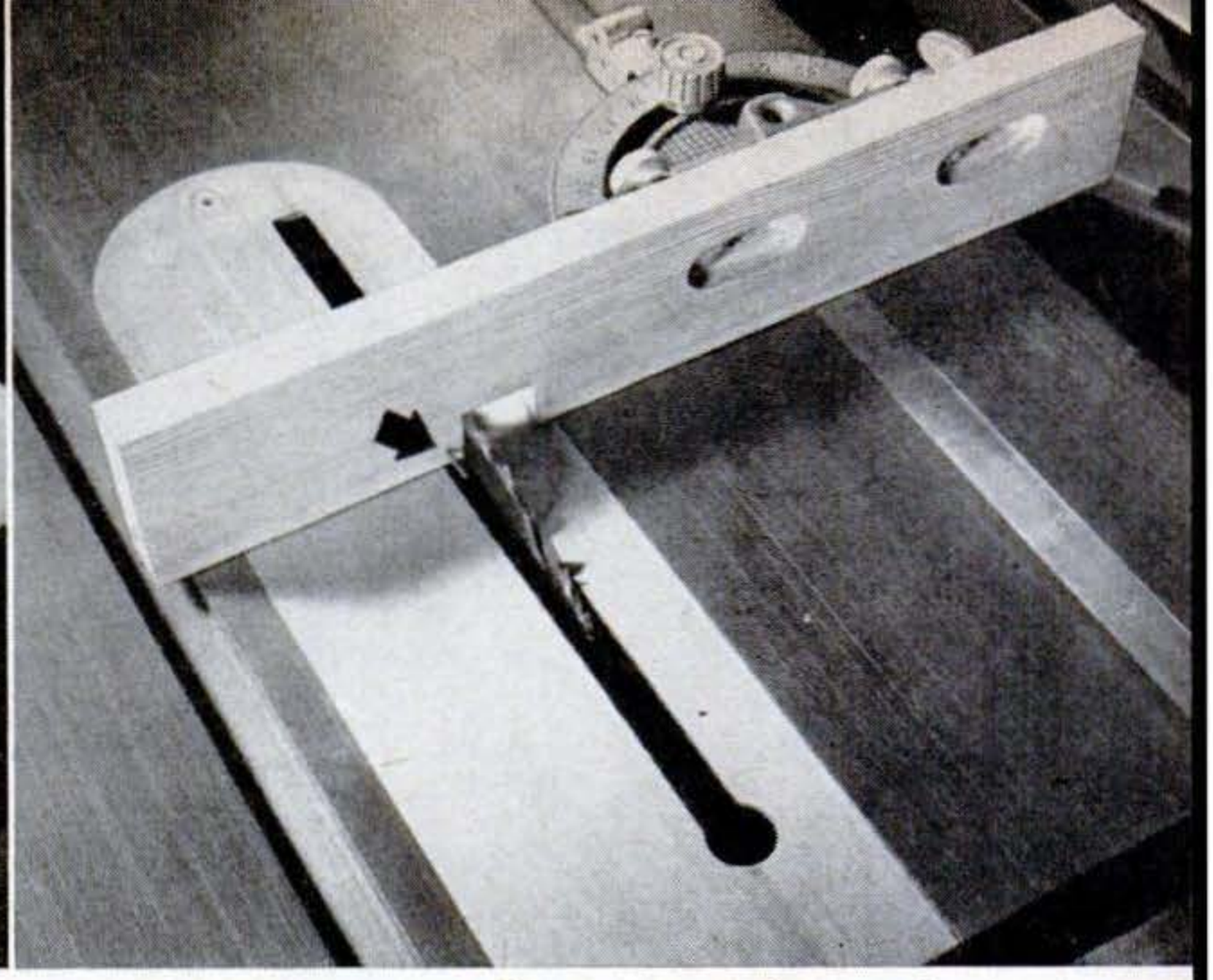
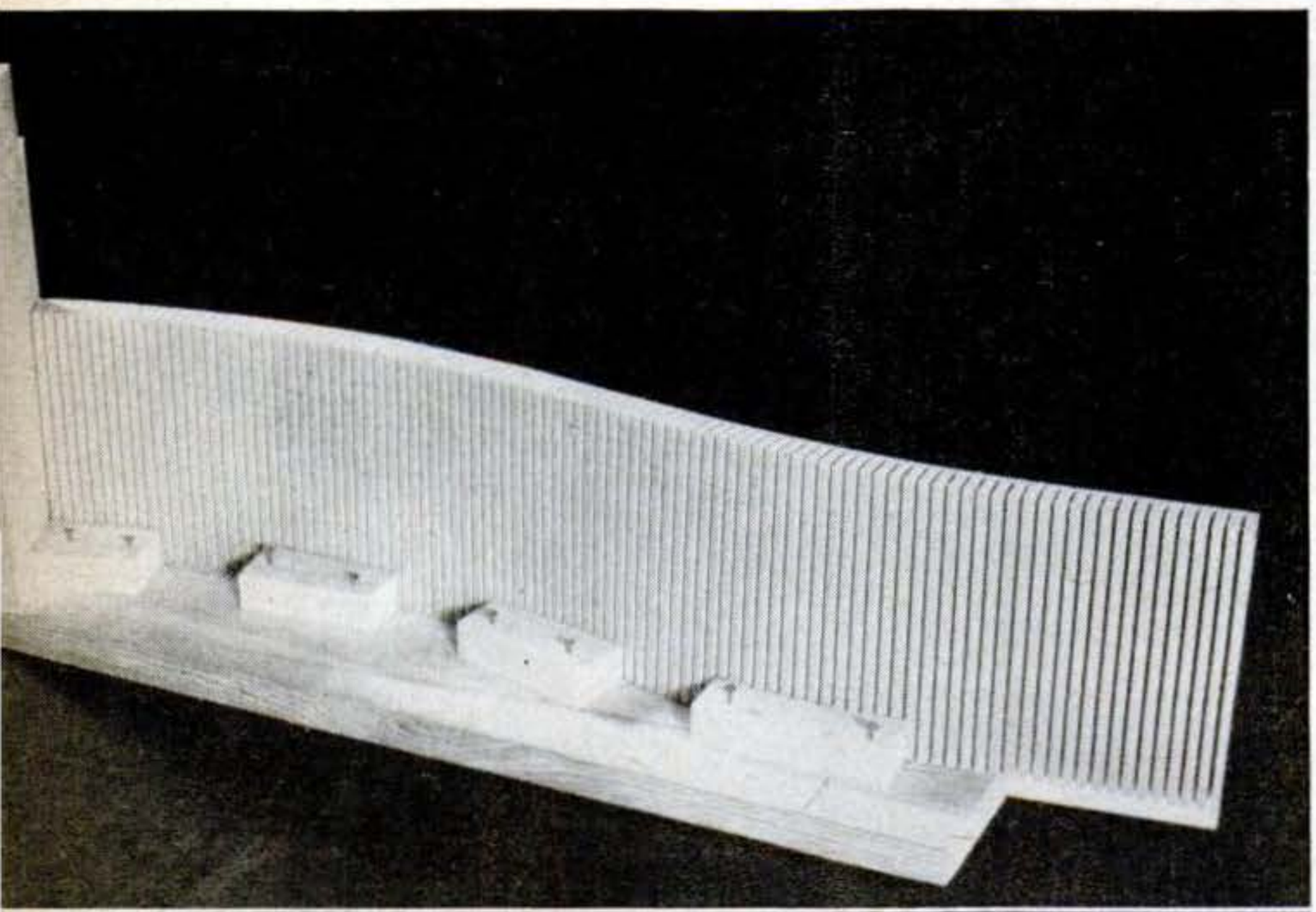


THREE WAYS TO TURN A CORNER: Thinned section as on top can be used for regular or irregular curves. Evenly spaced kerfs produce circular bends; varied spacing, graduated curves.

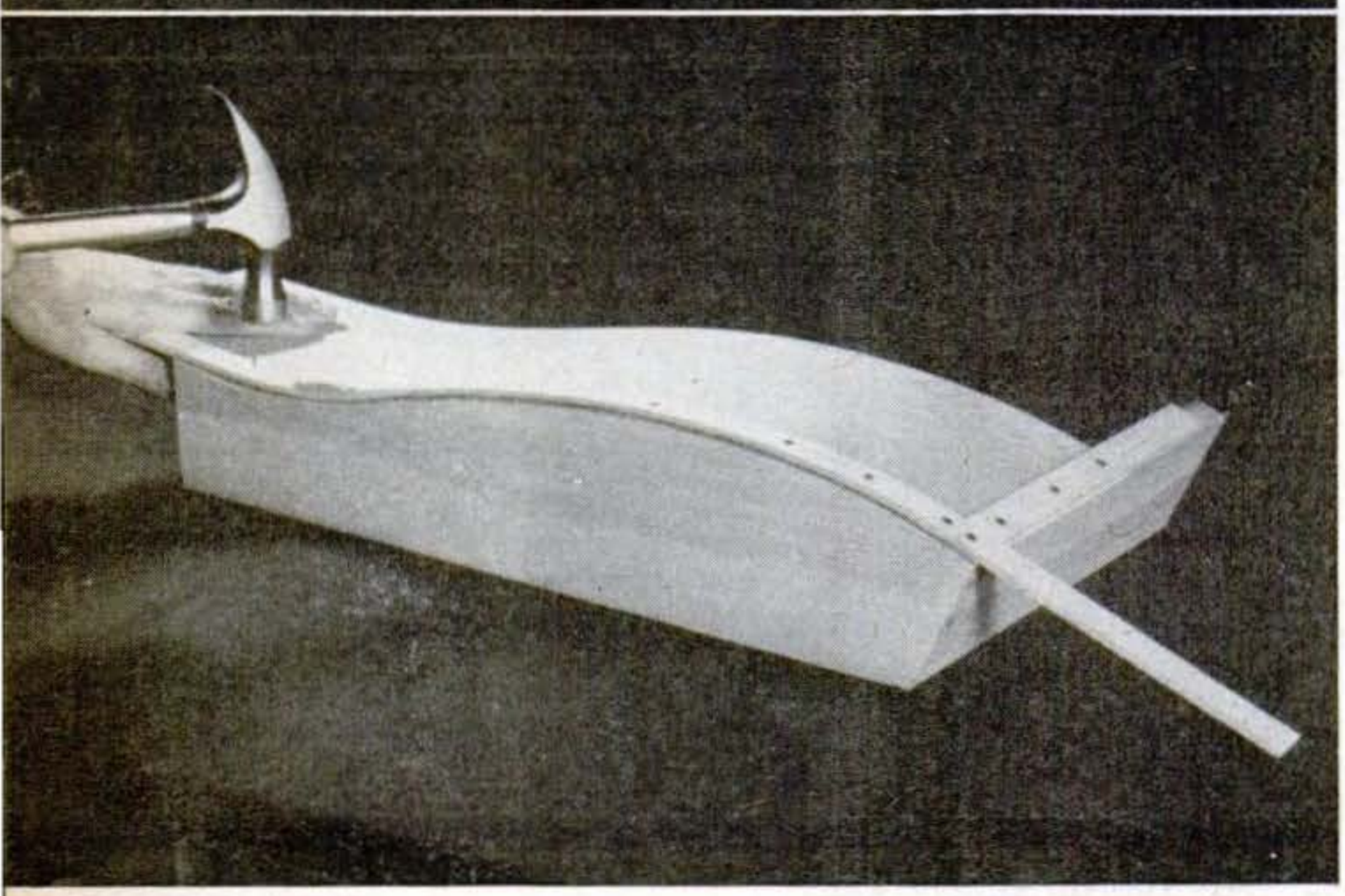


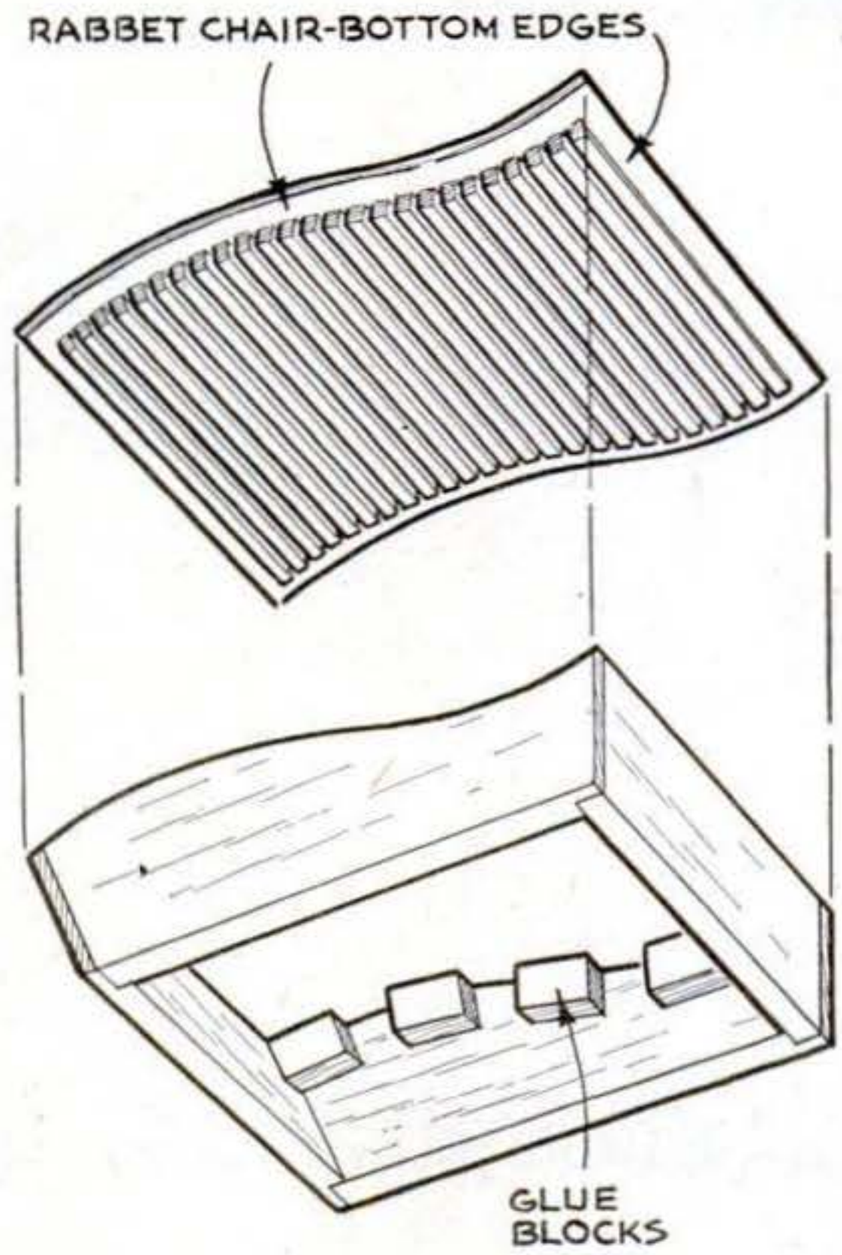
SLOTTED SPACING JIG lets you set the spacing pin the desired distance from the saw blade. Lay the first kerf over the pin for the second cut, and repeat as often as necessary.

How to use kerf curving in forming a contoured chair seat



RABBET THE EDGES of boards used for contoured chair seats. Then cut transverse kerfs for the desired curve. Apply glue to the rabbeted edges and attach to the frame members, using temporary battens and nails for clamps. For added strength, back the underside with glue blocks. Remove battens when the glue dries, and fill the holes with wood putty.





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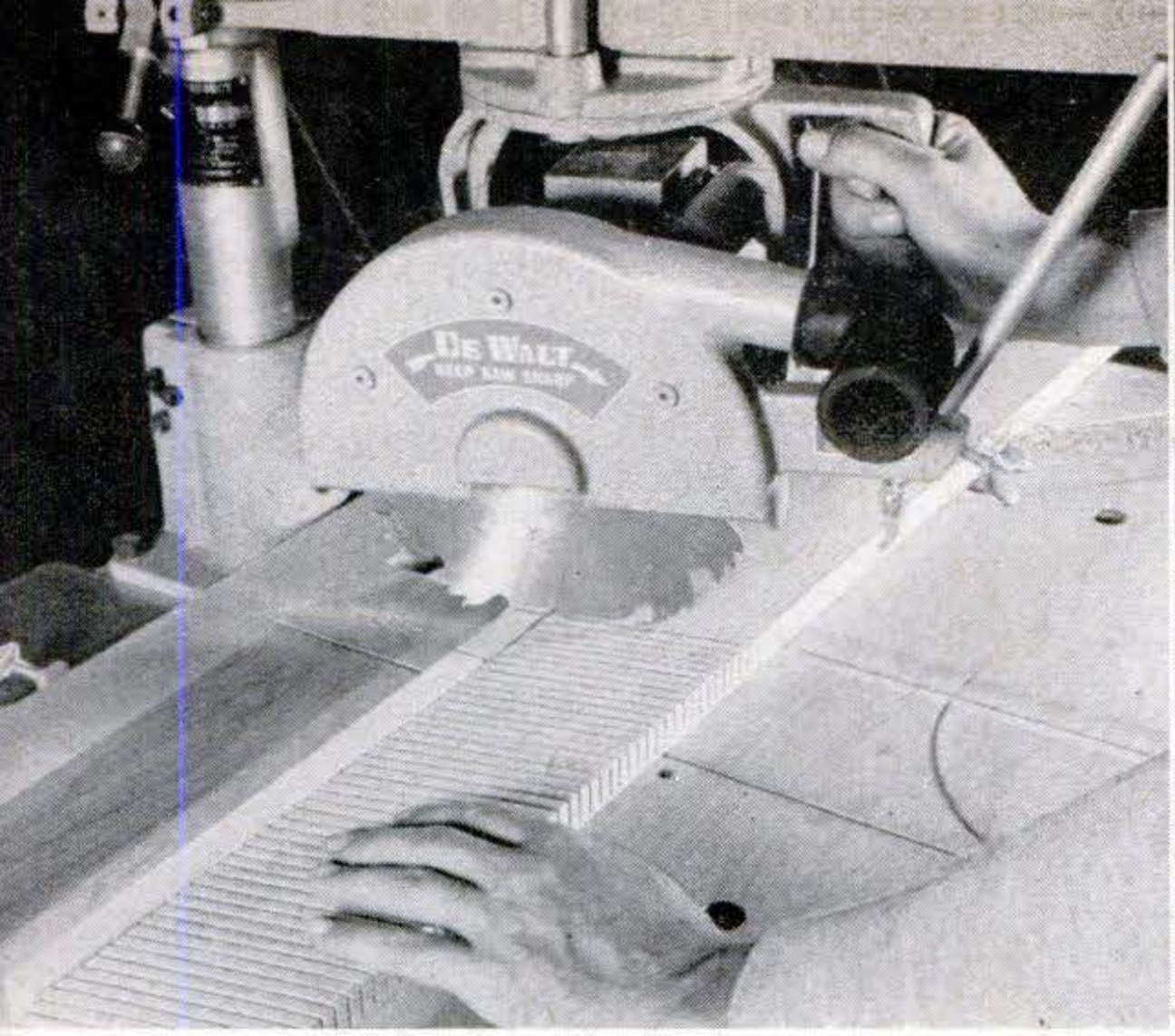
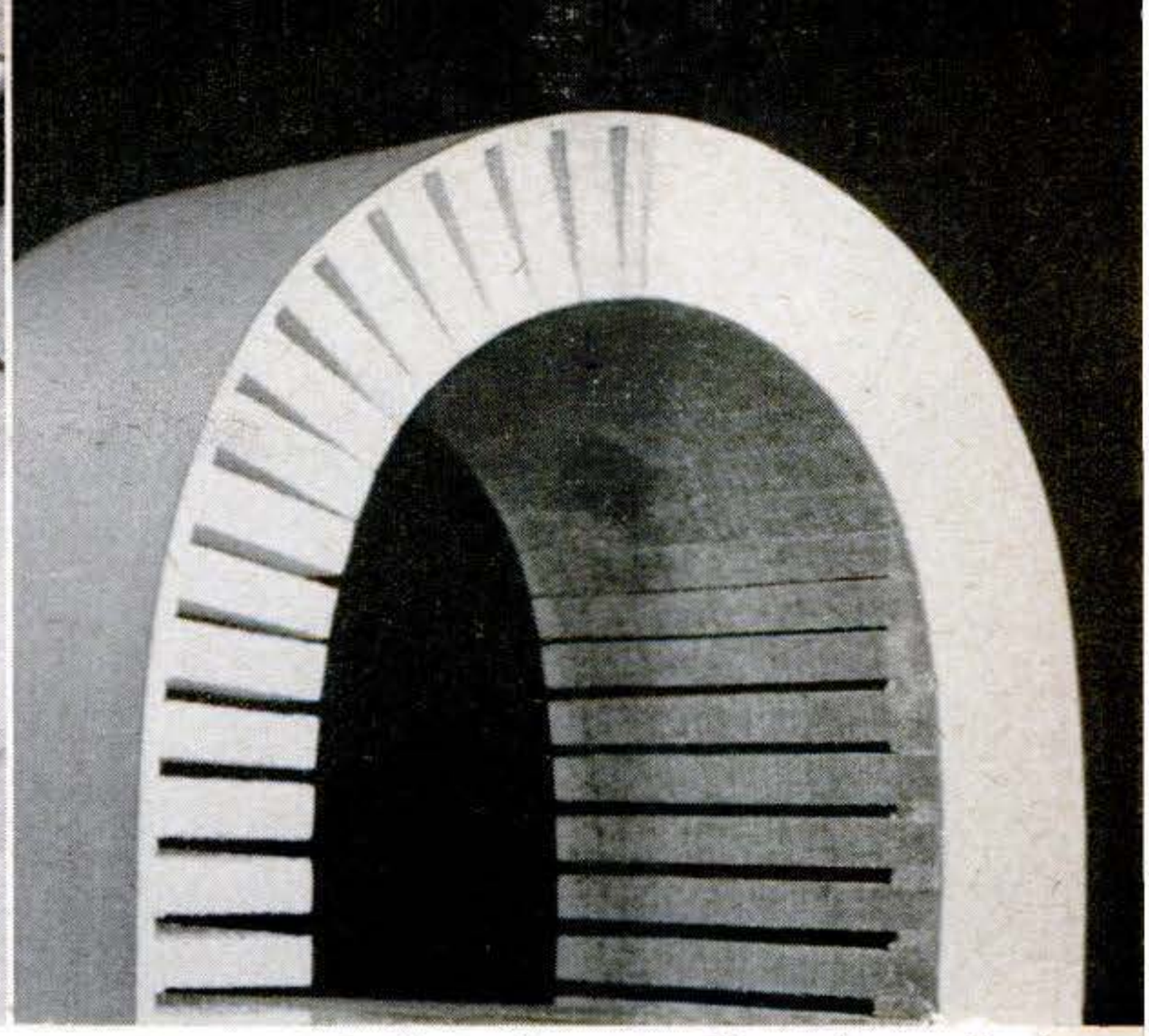
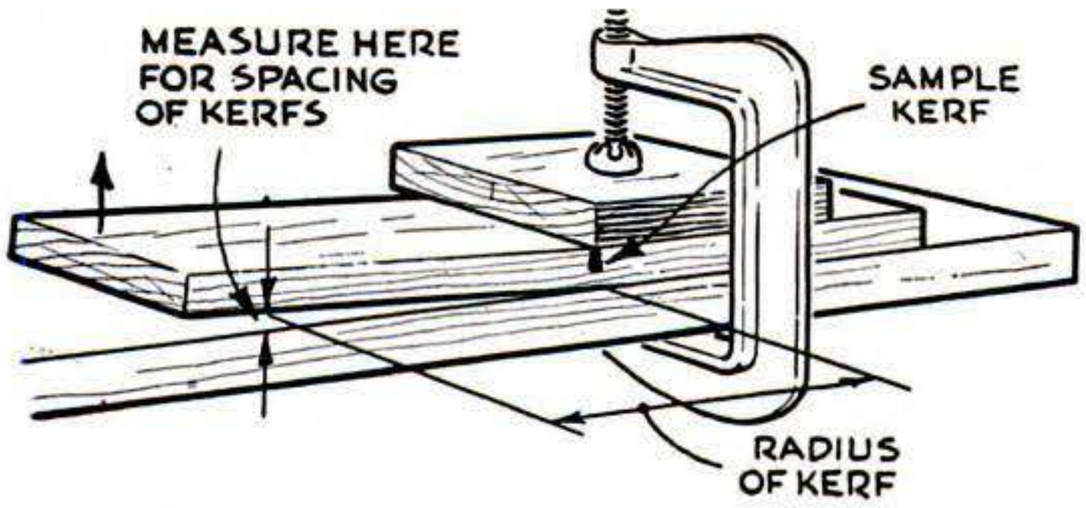


KERFS CUT AT AN ANGLE, or varying angles, permit contour bending of conical forms as well as spirals. With a radial saw, use a pencil mark on the work guide as a spacing aid.



FILL KERF ENDS that show on the edges of boards with wood putty. When dry, sand the edge smooth and apply a surface coating of putty. Sand again, then seal and paint.

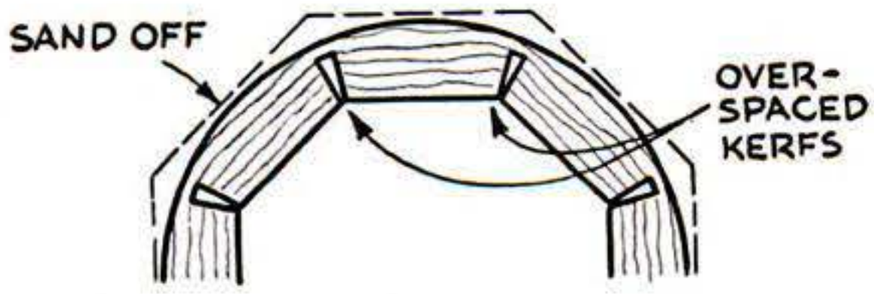
that closes the kerf at the surface. Next, clamp the stock to your workbench top as shown in the drawing. On the free side of the kerf, measure out the distance of



the desired curve radius. Then lift the end of the board until the kerf closes. The height from the table top to the underside of the board at the radius mark is the correct kerf spacing.

Other bending tips. Whenever possible, saw kerfs at right angles to the grain. This makes bending harder, but there is less danger of the thinned stock fracturing. After running off a few sample kerfs you'll get the "feel" of various woods and learn to judge the right depths for saw cuts. (The kerf can seldom be less than ¾ the thickness of the stock.)

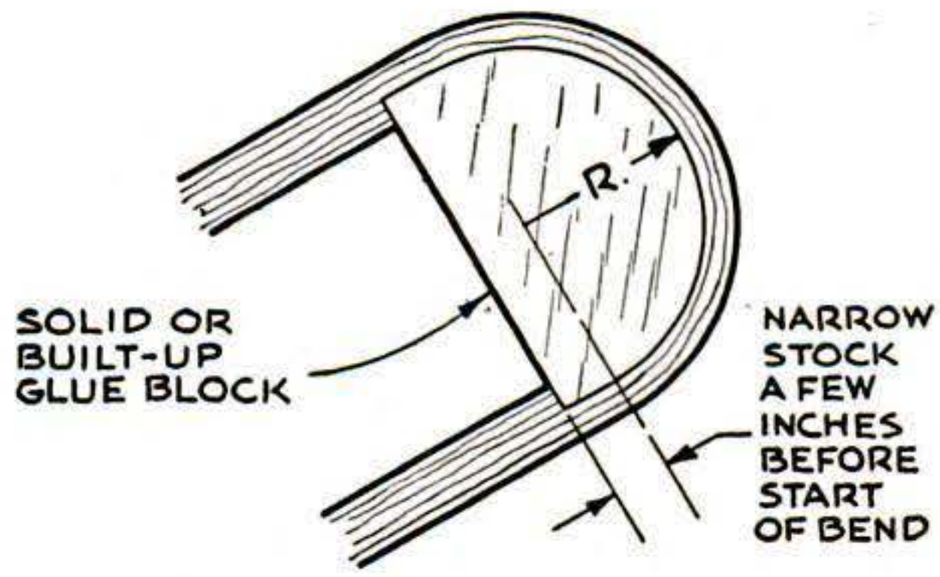
Always bring the work to shape slowly —don't force it. On stubborn pieces, wetting the unkerfed side makes bending easier. For certain projects you may find



it advisable to overspace kerfs. This will produce a succession of tangents, as shown in the drawing. The angles between the flats can then be sanded down to produce the desired continuous curve.

To hide the saw cuts, when the kerfed surface is exposed, a thin sheet of veneer may be glued on. Fill kerf ends that show on the edges of boards with a thick mixture of wood putty. On outdoor work, coat the kerfs with waterproof glue before you bend the wood.

Turning a corner. Where strips or panels are to turn an outside corner, and there's room to back them with glue blocks, you may find it easiest to reduce



the entire bending area to veneer thinness. If the stock is narrow, you can do this with a jigsaw or a bandsaw. To thin large panels, use a dado head, making a series of overlapping passes. In any case, the thinned-down section should be a couple of inches longer than the true length of the bend. This will give you a smooth and stress-free transition from the straightaways to the curve. END

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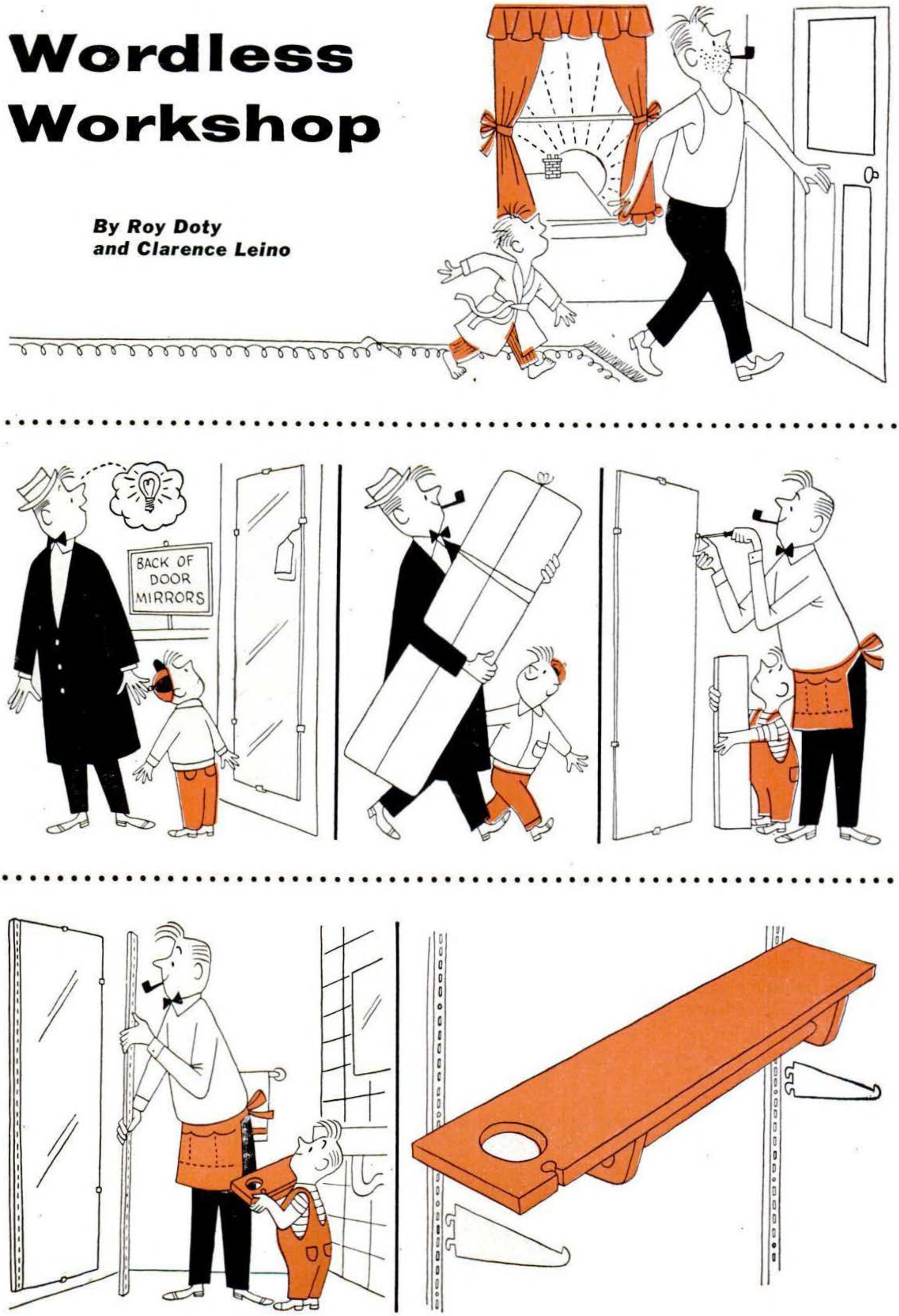
Wordless Workshop

By Roy Doty
and Clarence Leino



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Next Month: A serving shelf to keep breakfast foods neat

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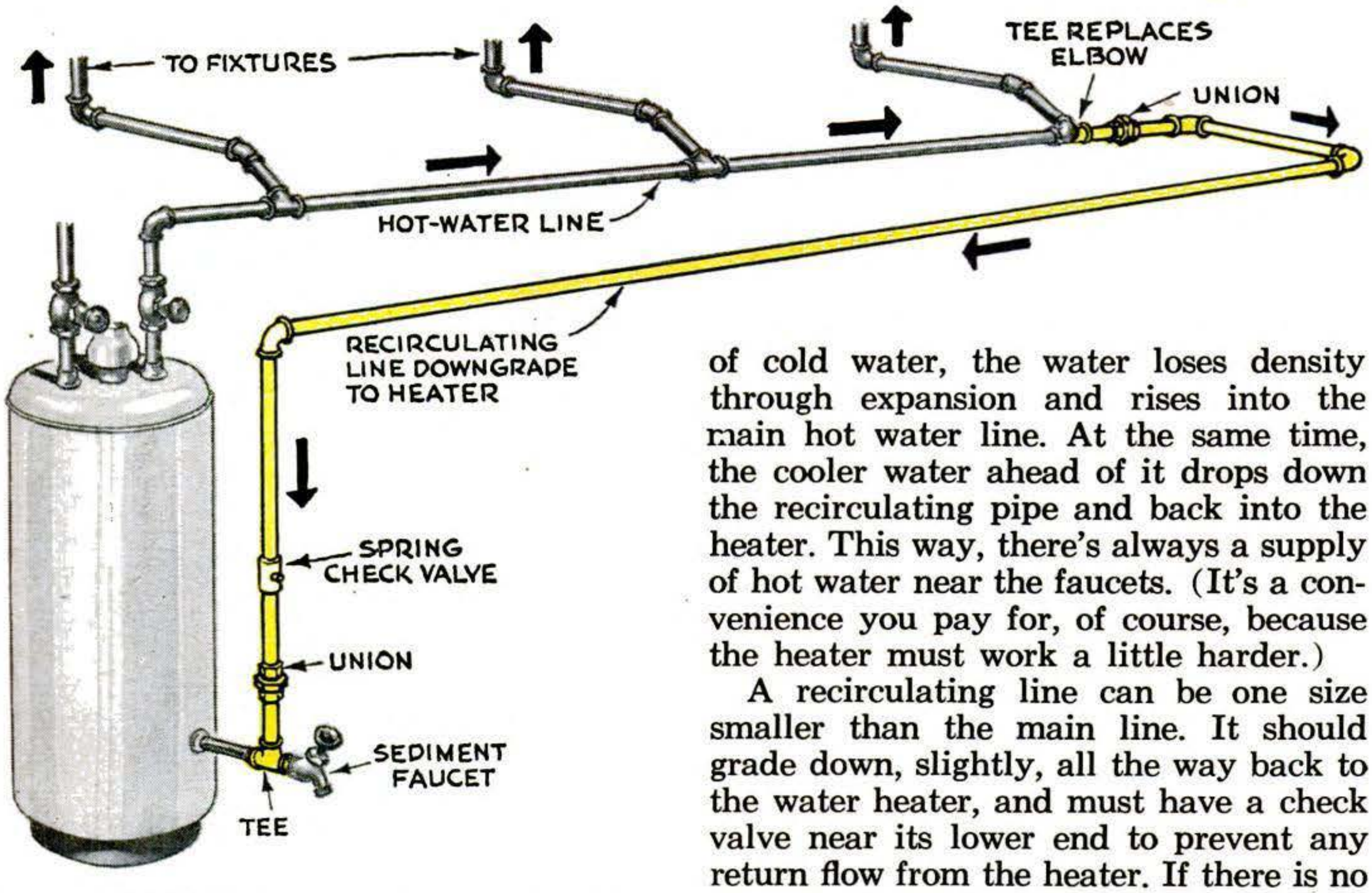
Must you wait while cold water runs out of the hot-water line? Recirculating it will give you:

Instant Hot Water from Your Taps



THERE'S no need for you to shiver in your shower, waiting for hot water that's trapped behind the chilled stuff standing in the delivery pipe. A recirculating line will eliminate this nuisance and put a heater's high-temperature supply on almost instant tap at every outlet in the system.

The principle behind a recirculating line is simple. Without one, a main water line is a dead-end street when all faucets are closed. If it's a long line, or one that is exposed to low temperatures, it can rob standing water of a lot of B.T.U.s. What's worse, at faucets farthest from a heater, all this water must be run off before you get a flow that's up to the thermostat reading.

A recirculating line cures the trouble by changing the dead-end street into a continuous, closed circuit. It's simply a return pipe, coupled between the far end of the main hot-water line and the bottom of the heater.

When the heater raises the temperature of cold water, the water loses density through expansion and rises into the main hot water line. At the same time, the cooler water ahead of it drops down the recirculating pipe and back into the heater. This way, there's always a supply of hot water near the faucets. (It's a convenience you pay for, of course, because the heater must work a little harder.)

A recirculating line can be one size smaller than the main line. It should grade down, slightly, all the way back to the water heater, and must have a check valve near its lower end to prevent any return flow from the heater. If there is no separate tapping for a connection near the bottom of the tank, you can tie into the heater behind the sediment faucet, using a tee and two nipples.

In a home where a water heater is higher than the hot-water pipes, you can still install a recirculating line. Since it won't work by gravity, you'll need a circulating pump to force cooled water back into the tank. Use a reverse-action aquastat to keep the pump from running continuously, wiring it to cut the pump in and out, depending upon the temperature of the water.—*Loyd Weaver.*

Squeaks are heard underfoot in the best of homes, and if you don't have them now the chances are you will eventually. When you do, this fact sheet will help you get rid of them. Save it now. Other pages for your Fix-It File will appear every month.

Next Month: Replacing tool handles.

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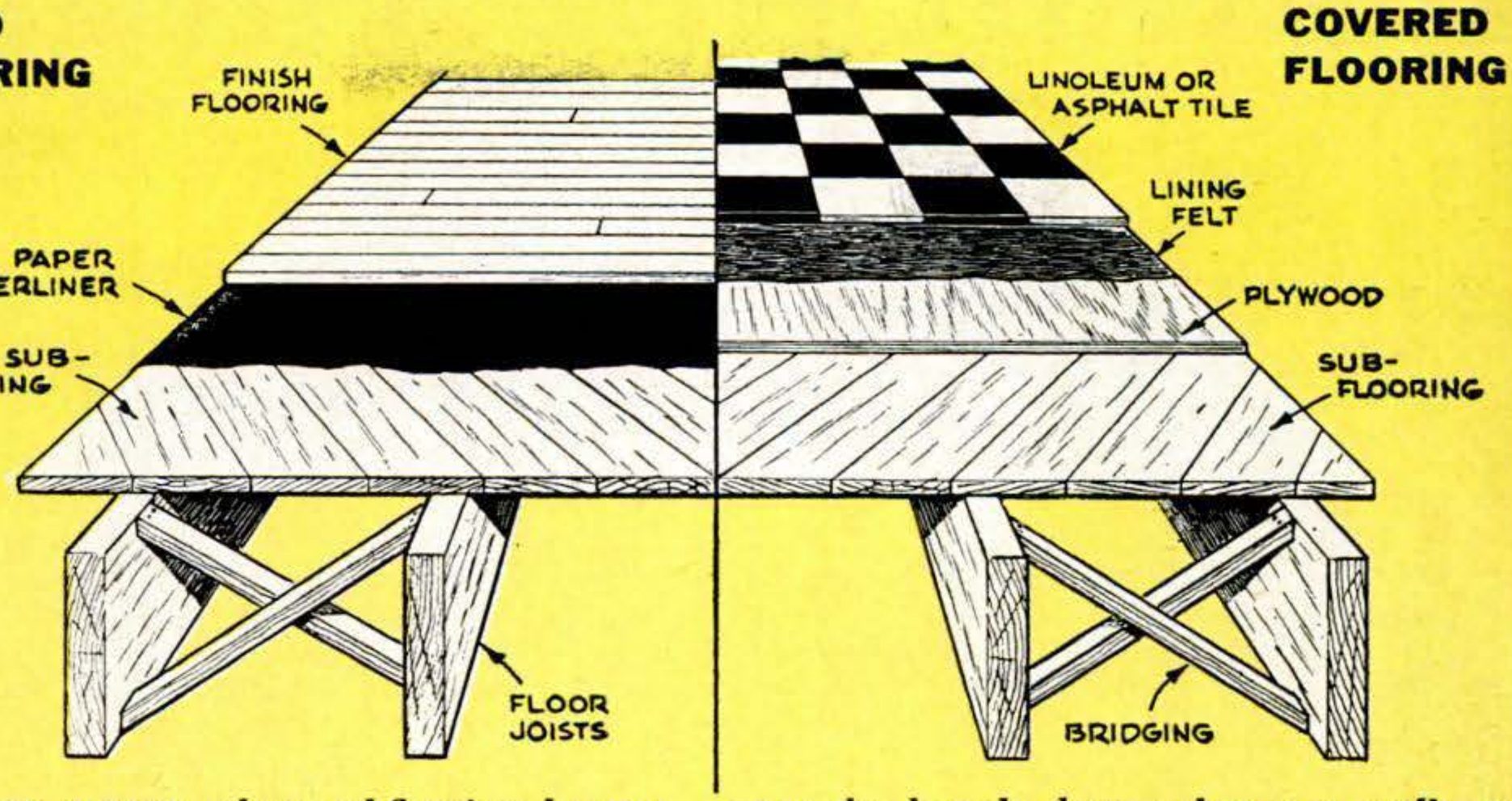
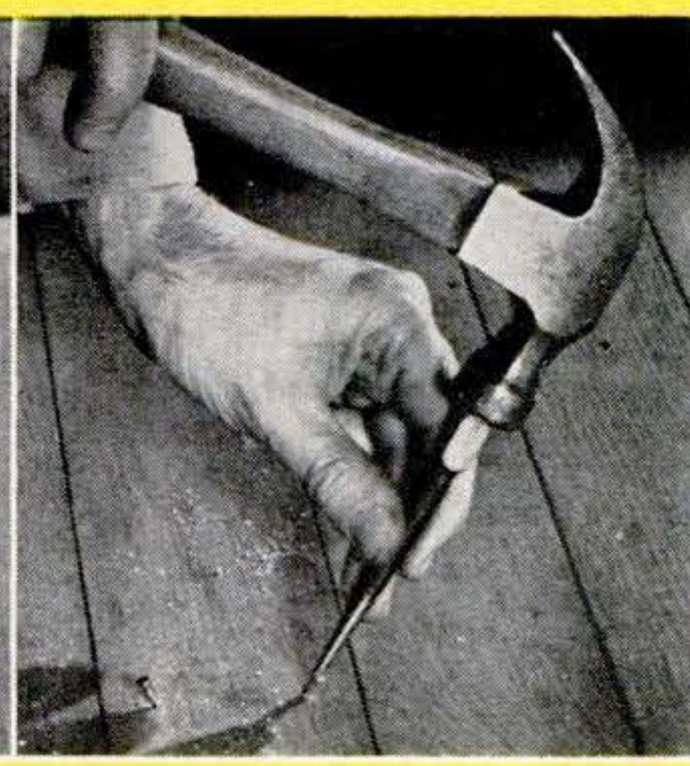
Popular Science Fix-It File



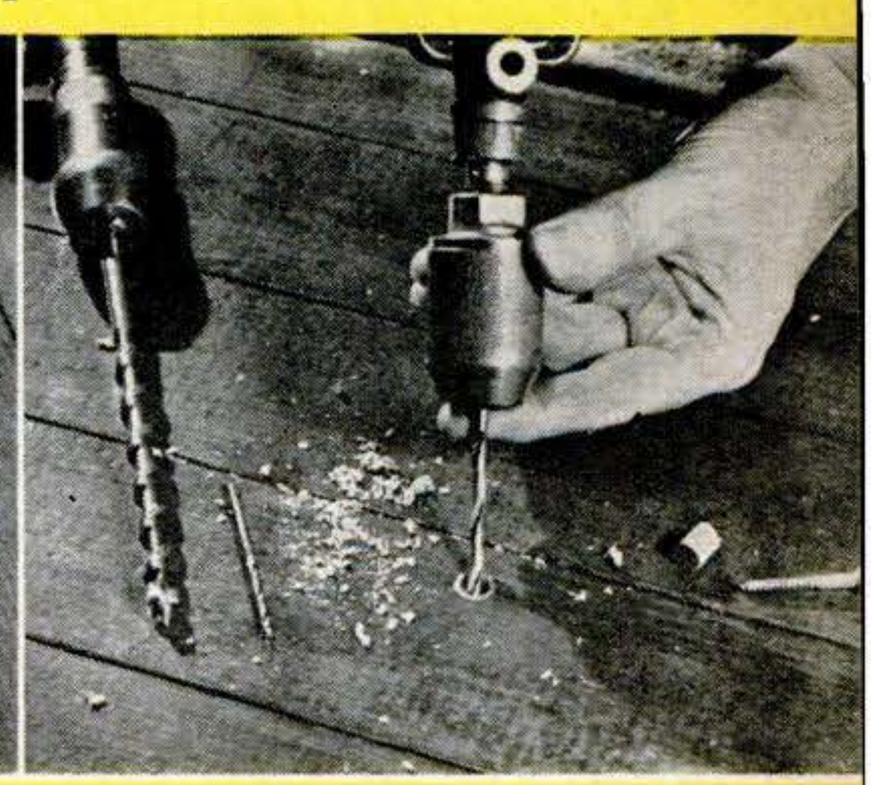
SQUEAKS OCCUR when subflooring loosens and pulls away from joists, or when finish flooring separates from subflooring. You press the boards down when you walk on them and the motion produces the noise. Bridging helps distribute floor load on joists.

Working above the floor to silence squeaks

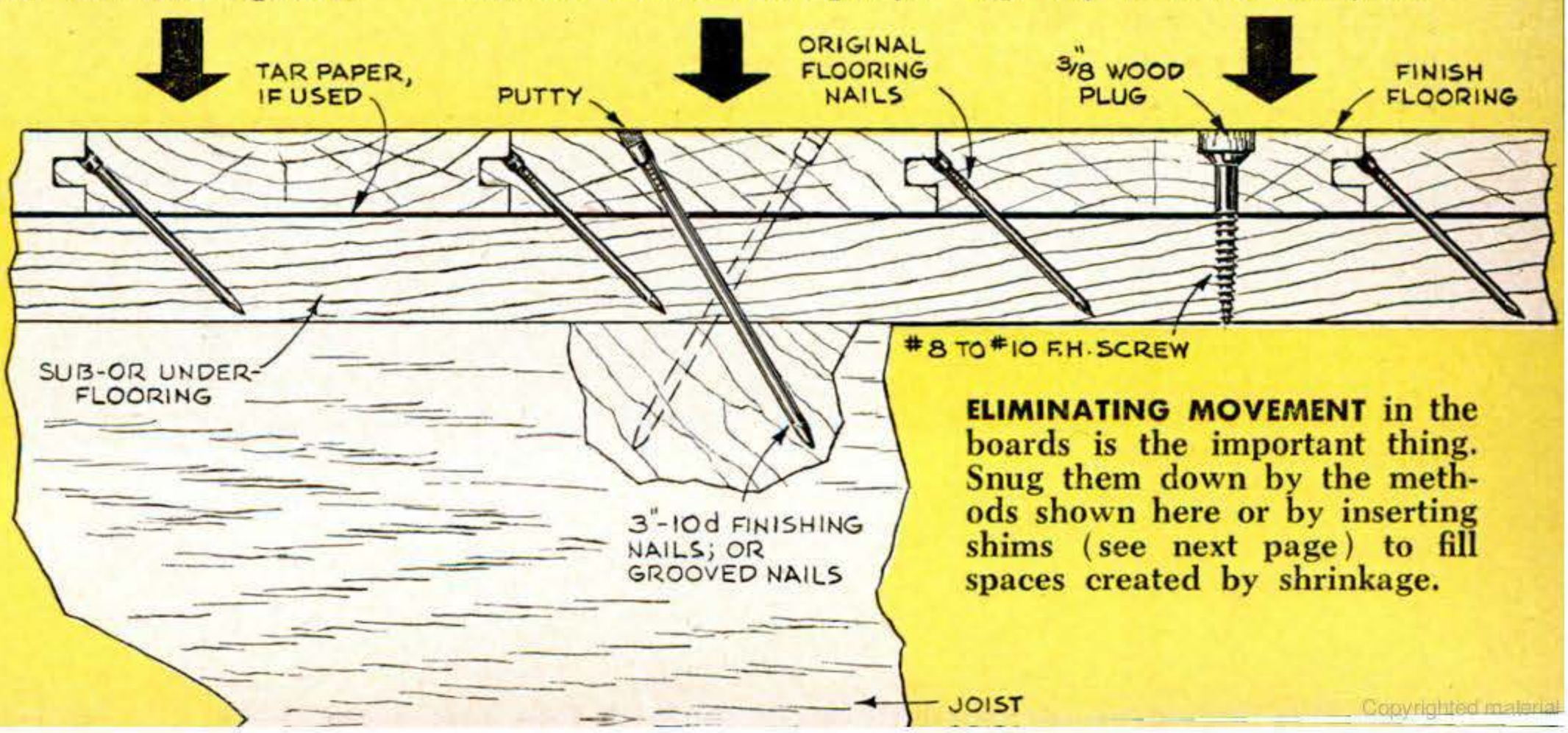
SLAM THE FLOORING BACK against the joists by pounding a padded wood block with a hammer. This may reset the original nailing firmly and cure squeaks.



ADD MORE NAILS driven at an angle to form a "V". Use 3" finishing nails and try to drive them through to joists. Recess heads with a nail set and cover with wood putty.



WOOD SCREWS will pull down stubborn boards. Drill pilot holes and counterbore for a concealing plug cut from the same wood as flooring. Try to reach the joist.



ELIMINATING MOVEMENT in the boards is the important thing. Snug them down by the methods shown here or by inserting shims (see next page) to fill spaces created by shrinkage.

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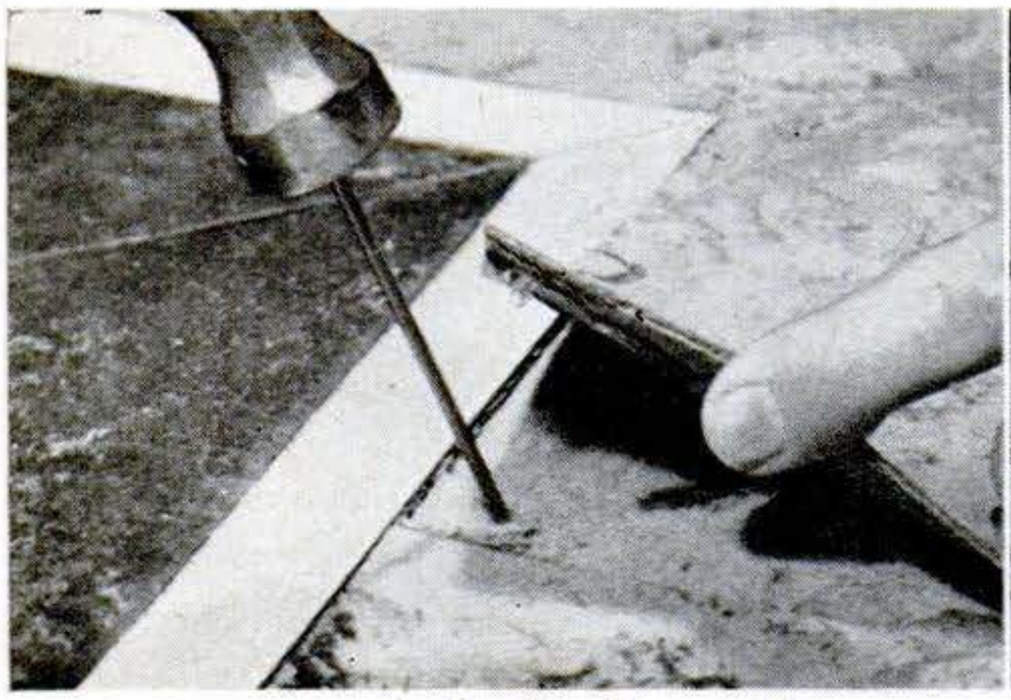
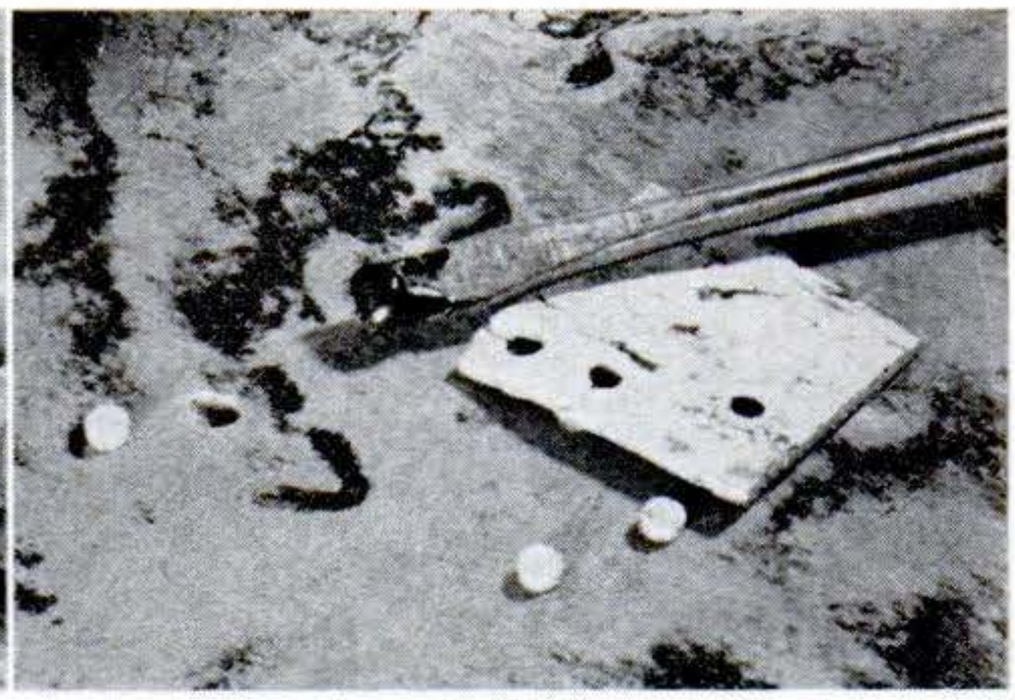
For squeaks under linoleum

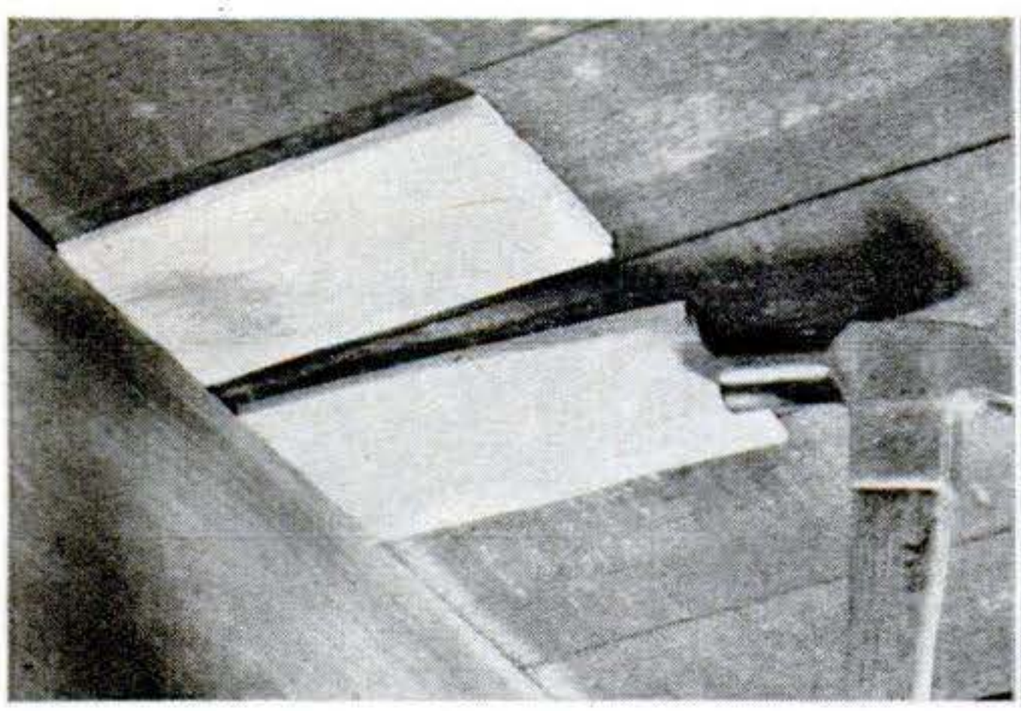


LIFT A CORNER of the linoleum, if convenient, or make an L-shaped cut with a knife, following the pattern. Nail subflooring to joist and cement linoleum back in place. Linoleum will bend easily if warmed.

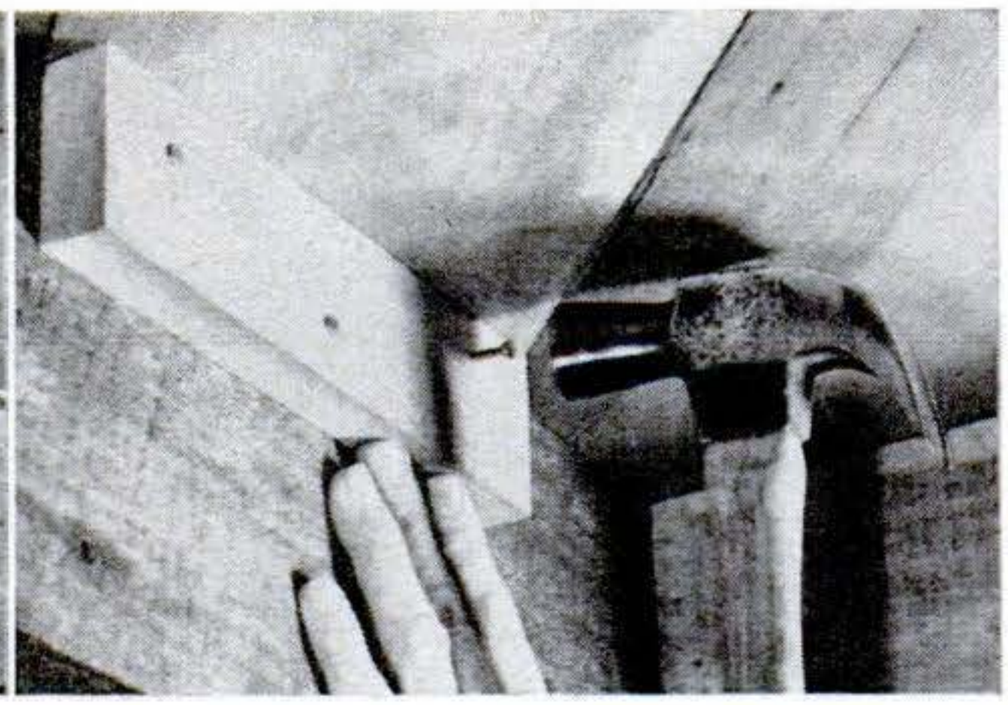


EASIER WAY is to drill through linoleum and drive nails or screws through subflooring to joist. Then cut plugs from a scrap of matching linoleum and cement them in counterbored holes. Sand plugs flush and wax.

When floor is accessible from below:
1. Loose boards can be supported . . .

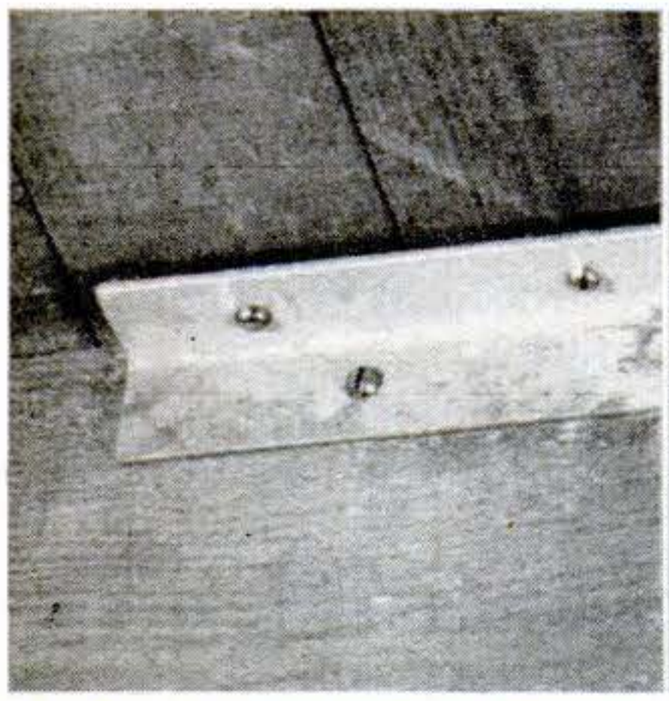


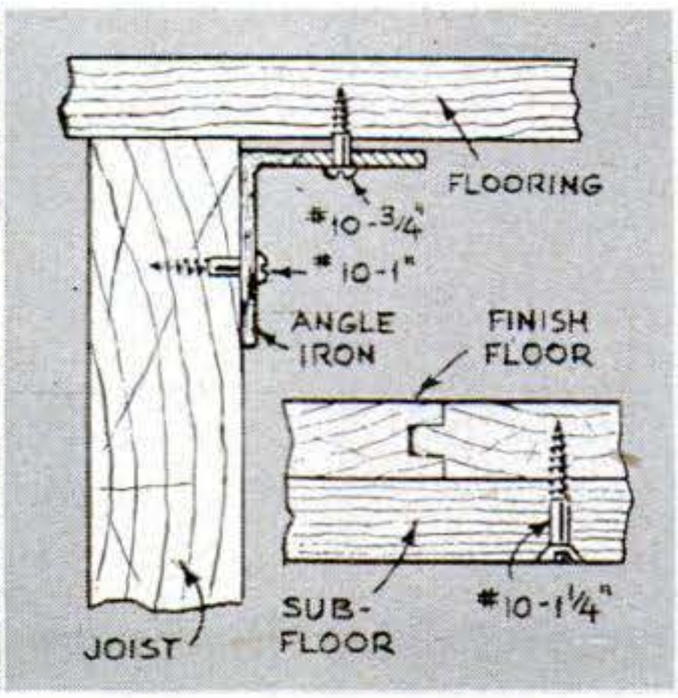
DRIVE THIN WEDGES between raised flooring and joists after locating squeak by having someone walk on floor. Don't drive wedges too hard or boards will be forced upward.

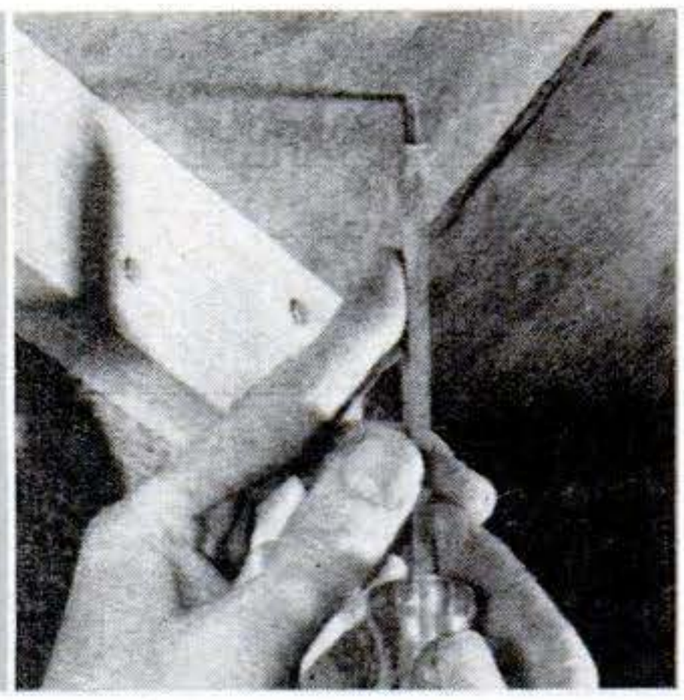


NAIL A WOOD STRIP along the top edge of the joist to support raised flooring when it is walked on. Press the strip firmly against the flooring while driving in the nails.

2. Or loose boards can be pulled down







INSTALL ANGLE-IRON STRIPS just below top edge of the joist, then use screws to pull flooring down as in photo at left and in drawing. Wood cleats can be similarly used instead of angle iron. If squeaks persist after the subflooring is pulled down, drive screws through clearance holes in the subflooring (above, right) to pull the finish flooring against it. Caution: Don't permit screws to come through the finish flooring.

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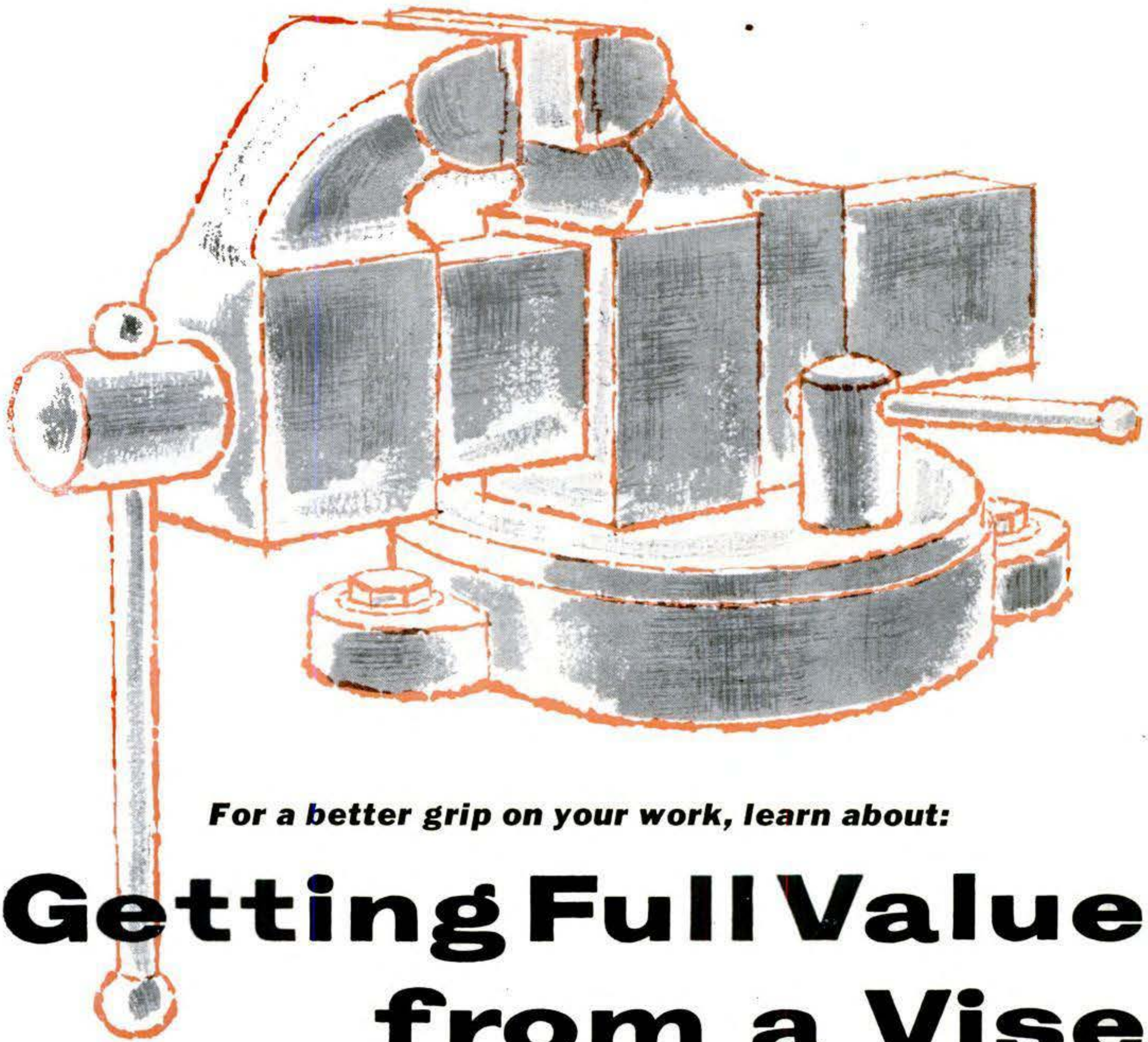


For a better grip on your work, learn about:

Getting Full Value from a Vise

By William E. Moore

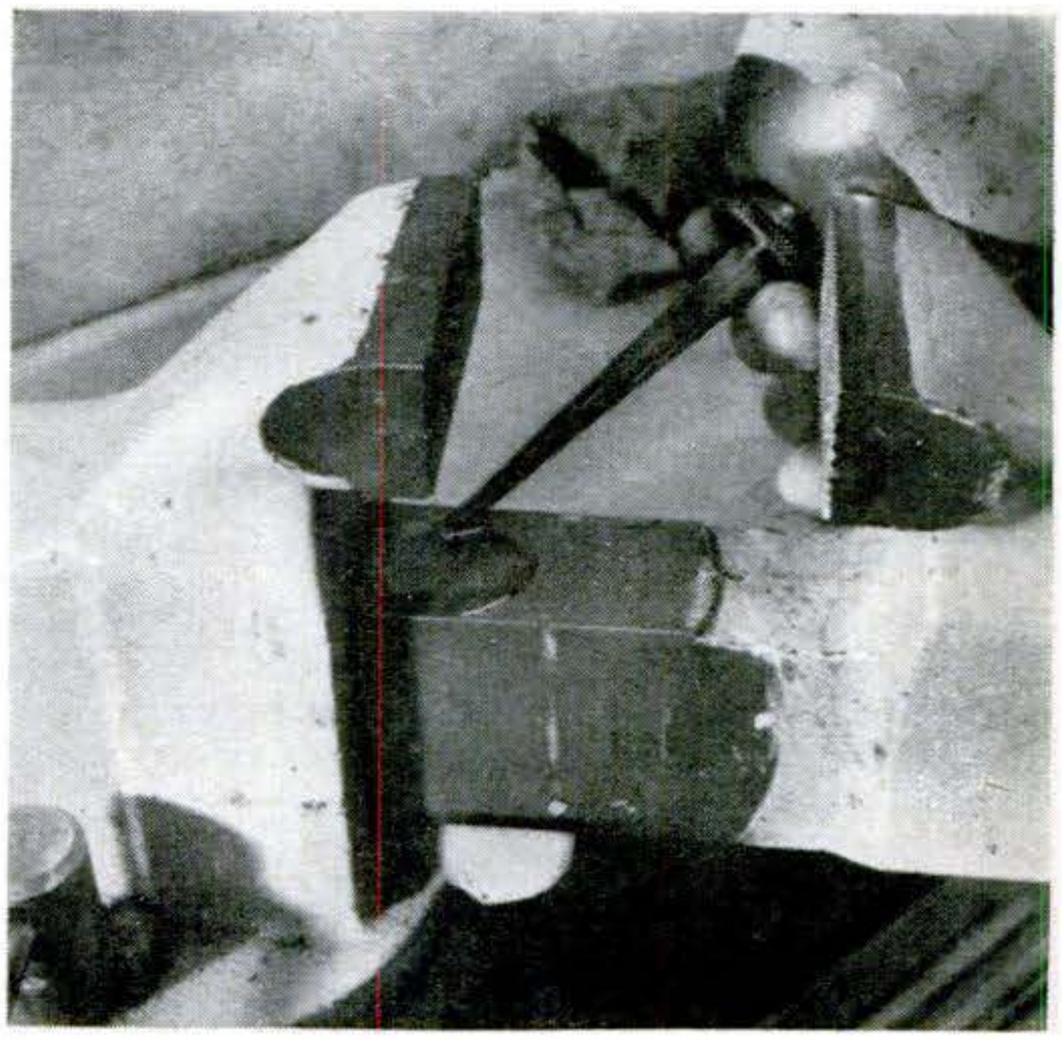
A VISE is an indispensable third hand for all sorts of jobs. But its gripping action is so powerful that unless you use it correctly you can easily damage the work, and even the vise mechanism.

That's why it's important to know the right ways to set up materials and apply pressure. Used to its best advantage, your vise becomes a versatile time- and energy-saving tool.

Experienced benchmen have developed five important rules for the use and care of a vise:

Protect the work by placing padding material on either the vise jaws or the work itself.

This applies both to wood- and metal-working vises. Even when little pressure is applied to the vise handle, soft wood



OIL THE MOVING PARTS of a vise for long life and smooth action. After working oil into friction areas, remove the excess with a clean rag. Painting nonworking parts of a metal vise prevents rust, makes cleaning easy.

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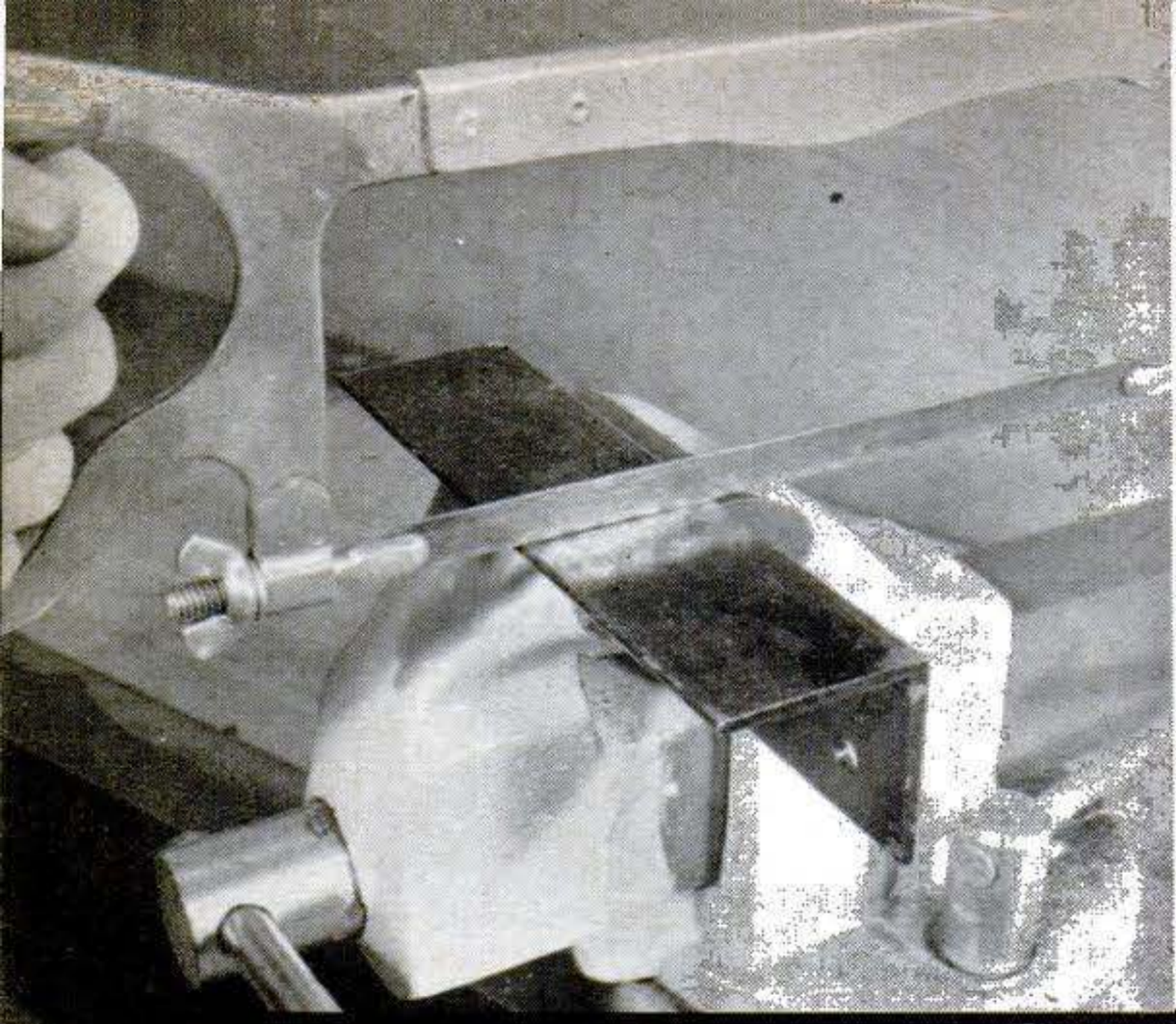
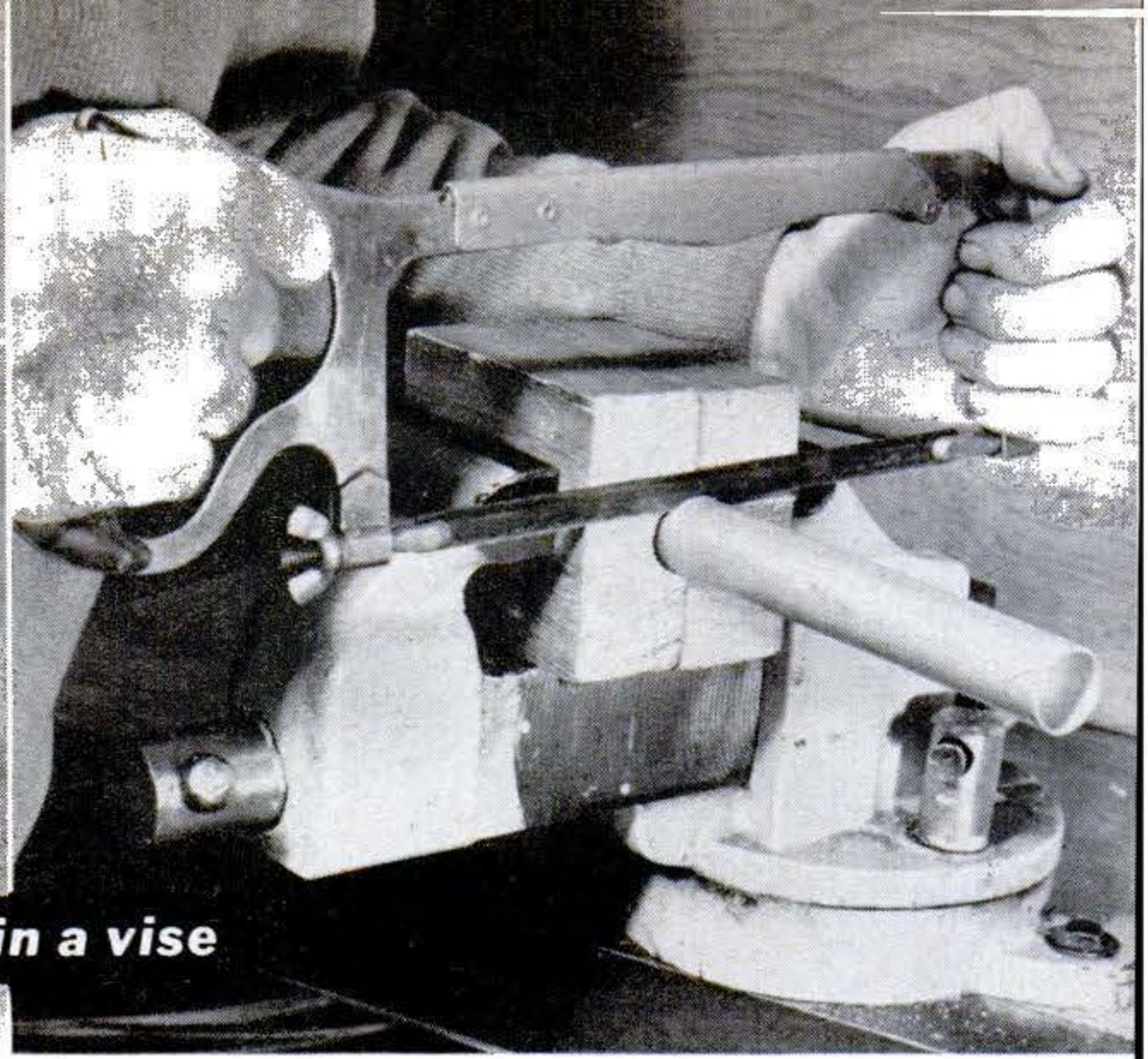
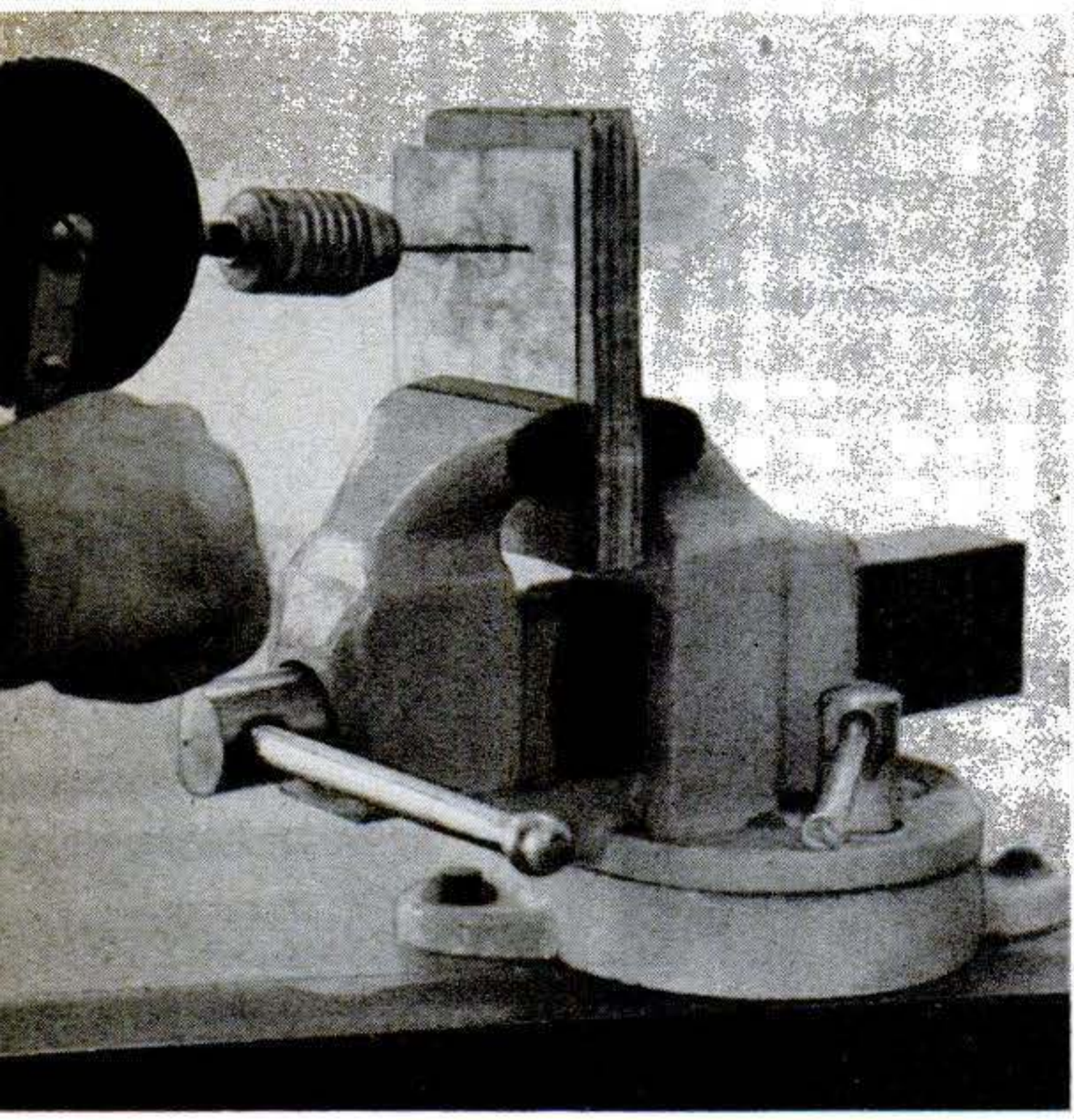
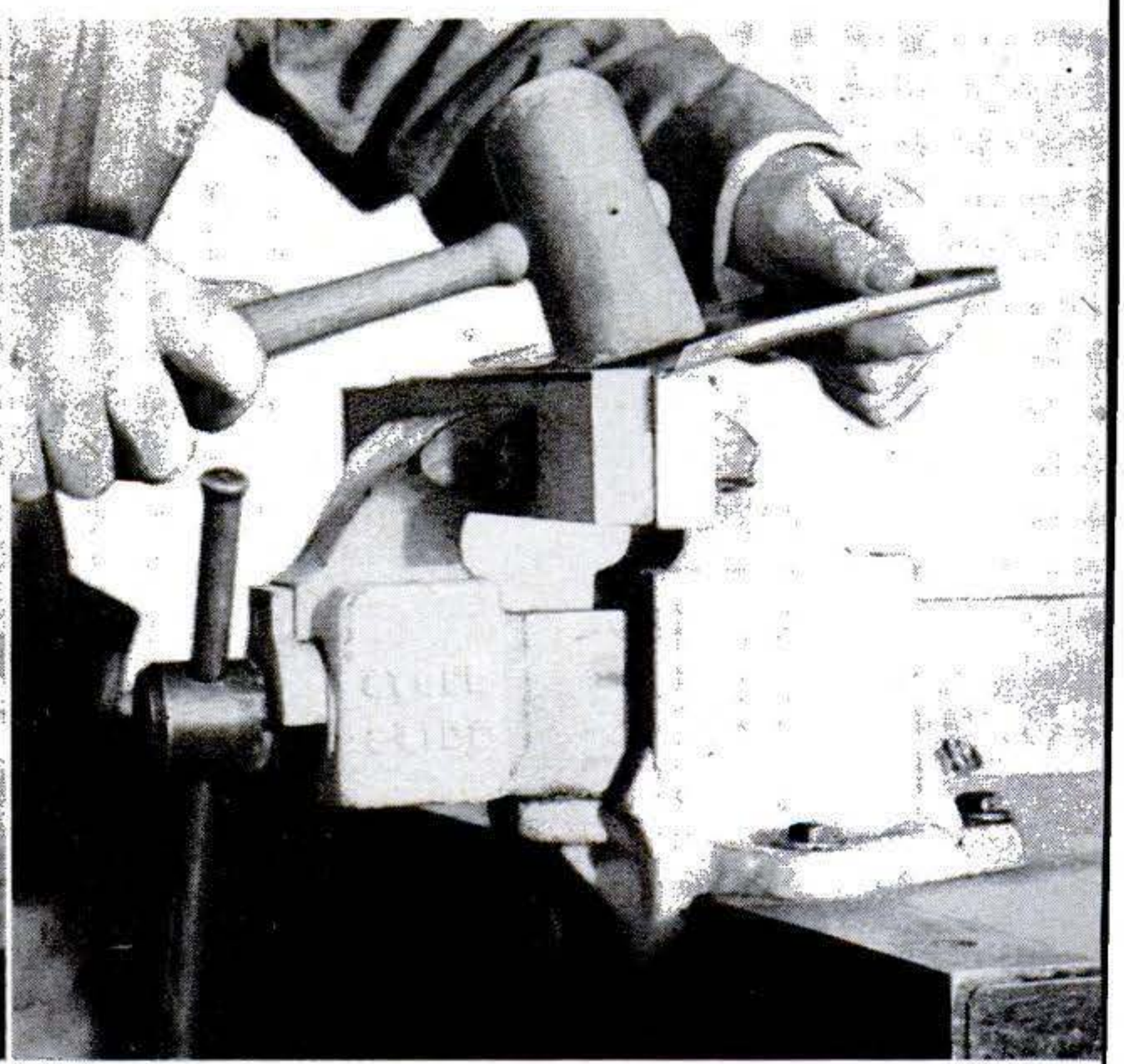




How to set up 10 common jobs in a vise

1 HACKSAWING METAL: For long blade life, position the work so at least three teeth bear on the metal at all times. This piece of angle iron should be repositioned in the vise before sawing through the second side. When cutting pipe, a jig with a squared end, as above, helps get right-angle cuts. To avoid tearing thin-walled stock and damaging saw teeth, release the vise, turn the pipe a bit and reclamp each time the saw blade breaks through.





4 DRILLING HOLES IN SHEET METAL: Clamping small pieces of sheet metal in a vise keeps them from turning when you drill holes through them. Back the stock with a block of wood, as shown above, after center-punching.

5 FORMING SHEET METAL: A vise, two blocks of hardwood and a mallet can take the place of a brake for sheet-metal bending. Clamp the smaller area between the blocks and bend by hand. Then sharpen the angle with the mallet.

and metals are easily damaged. Paper, cardboard, a scrap of sheet metal or a block of wood may mean the difference between marred surfaces and a professional job.

Apply just enough pressure on the vise handle for the job you are doing. A word of caution: Close the vise slowly on soft or brittle materials so you get the feel before overtightening.

Never extend the vise handle with a length of pipe to increase your mechanical advantage. Many vises are designed to withstand only the pressure developed

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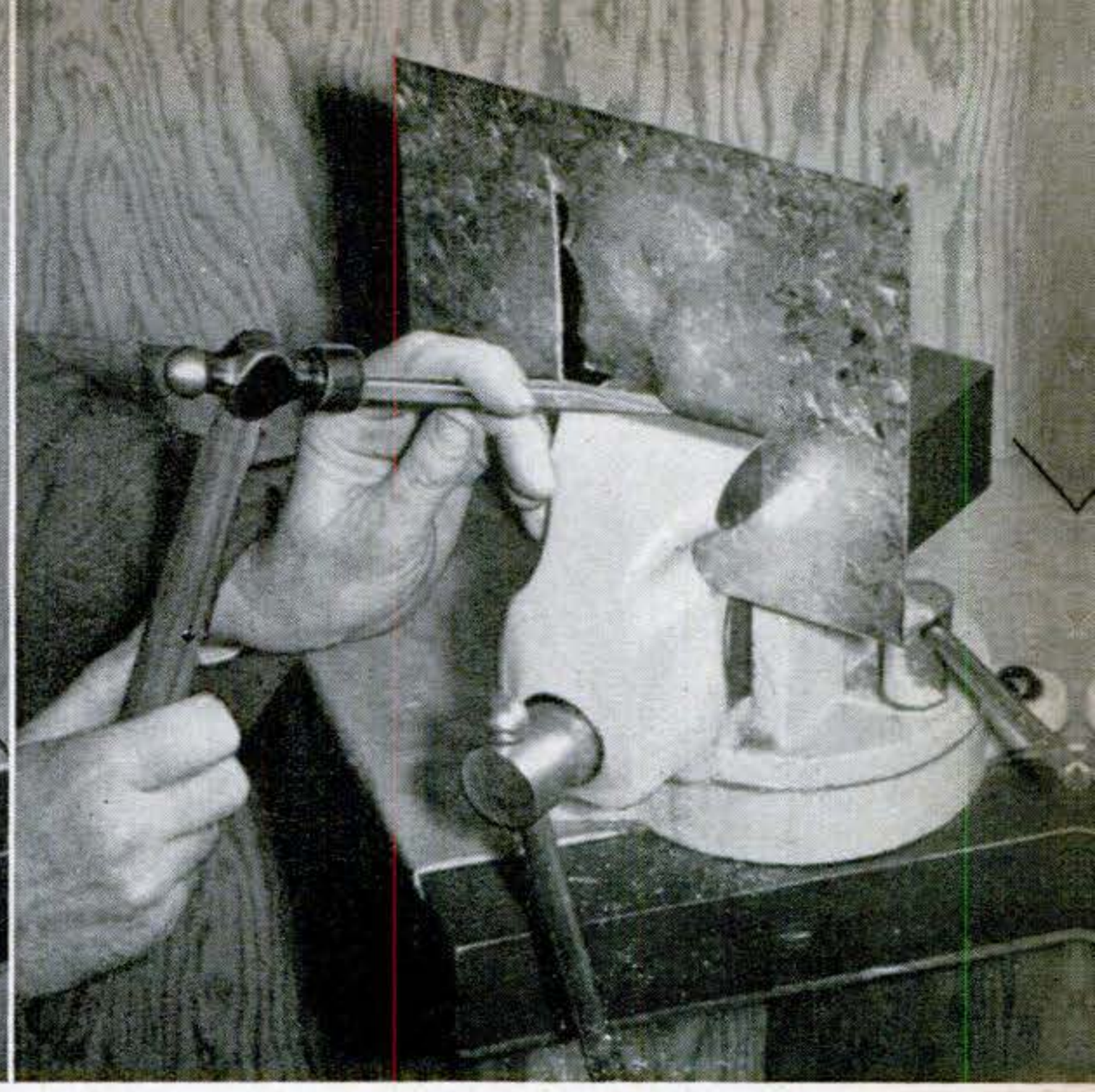
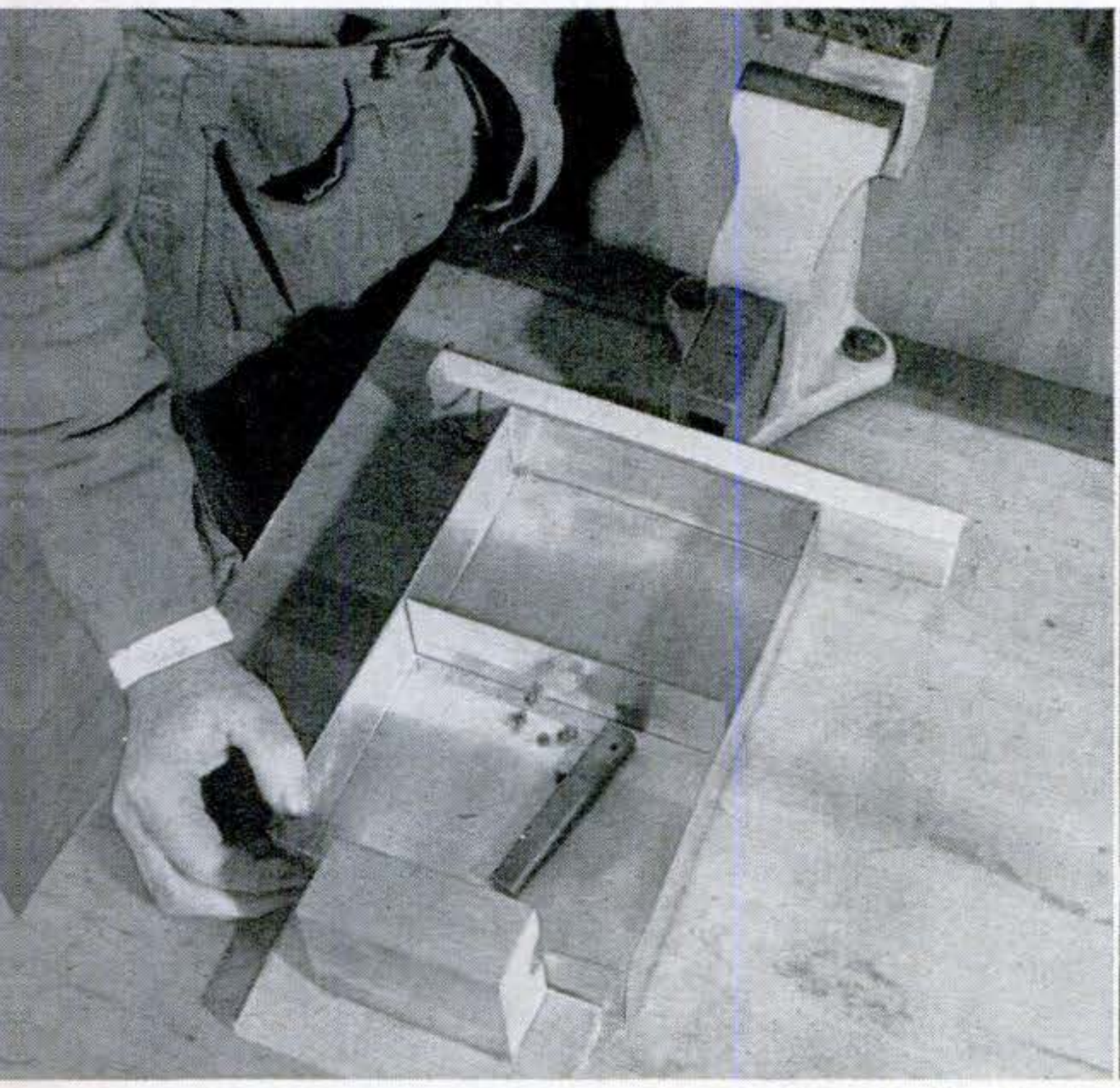
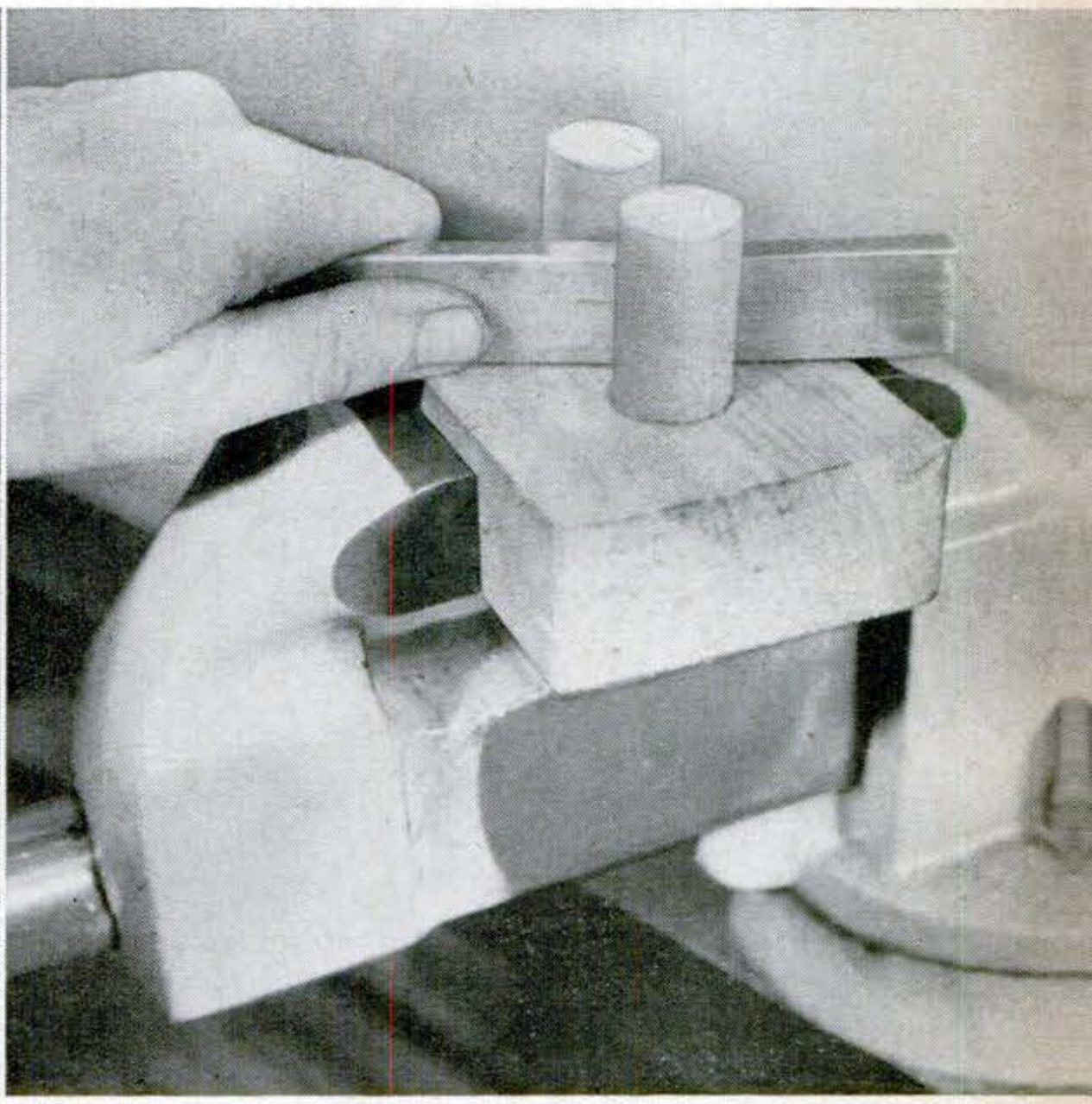
2 FILING SHEET-METAL EDGES: Avoid vibration, a possible slip of the file and a cut hand by clamping the metal between blocks of scrap wood. File along the length of the metal edge, never across it. Use a fine-toothed file.



3 CUTTING A STRAIGHT-EDGED HOLE: Position metal so the jaw edges are aligned with the cuts to be made. The forward edge acts as a guide for the chisel edge, and the rear jaw assists by offering a stiff shearing edge.



6 CLAMPING UNWIELDY ITEMS: Use the back of a vise screw to develop clamping pressure between it and a block of wood screwed to the bench top. In the photo above, a metal tray is held firmly for corner and partition soldering.



7 BENDING METAL BARS: Two short pieces of tough maple dowel rod, driven into holes in a vise-held two-by-four, will let you shape soft-metal bars into ornamental scrollwork. You can also buy bending jigs made of metal.

by the handle that is specifically made for the tool.

Work close to the jaws. Sawing, planing, chiseling or hammering at any distance from the jaws causes vibration and movement that may damage both the work and your tools. A saw blade can be overheated and permanently softened in this way.

Plan ahead when you position the work in the vise. You waste time and increase the risk of damaging the work material each time you reposition it between the vise jaws. With a bit of fore-

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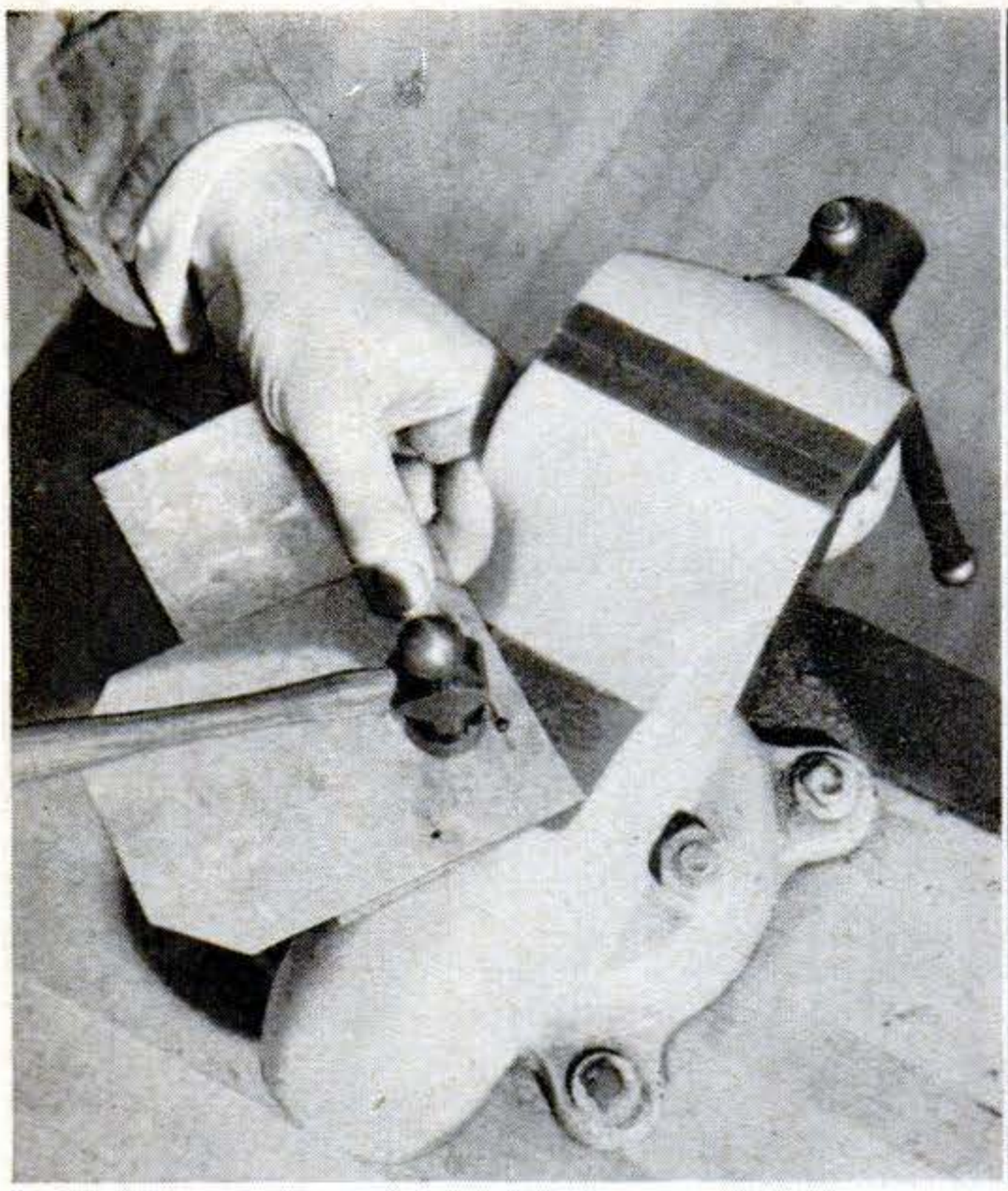
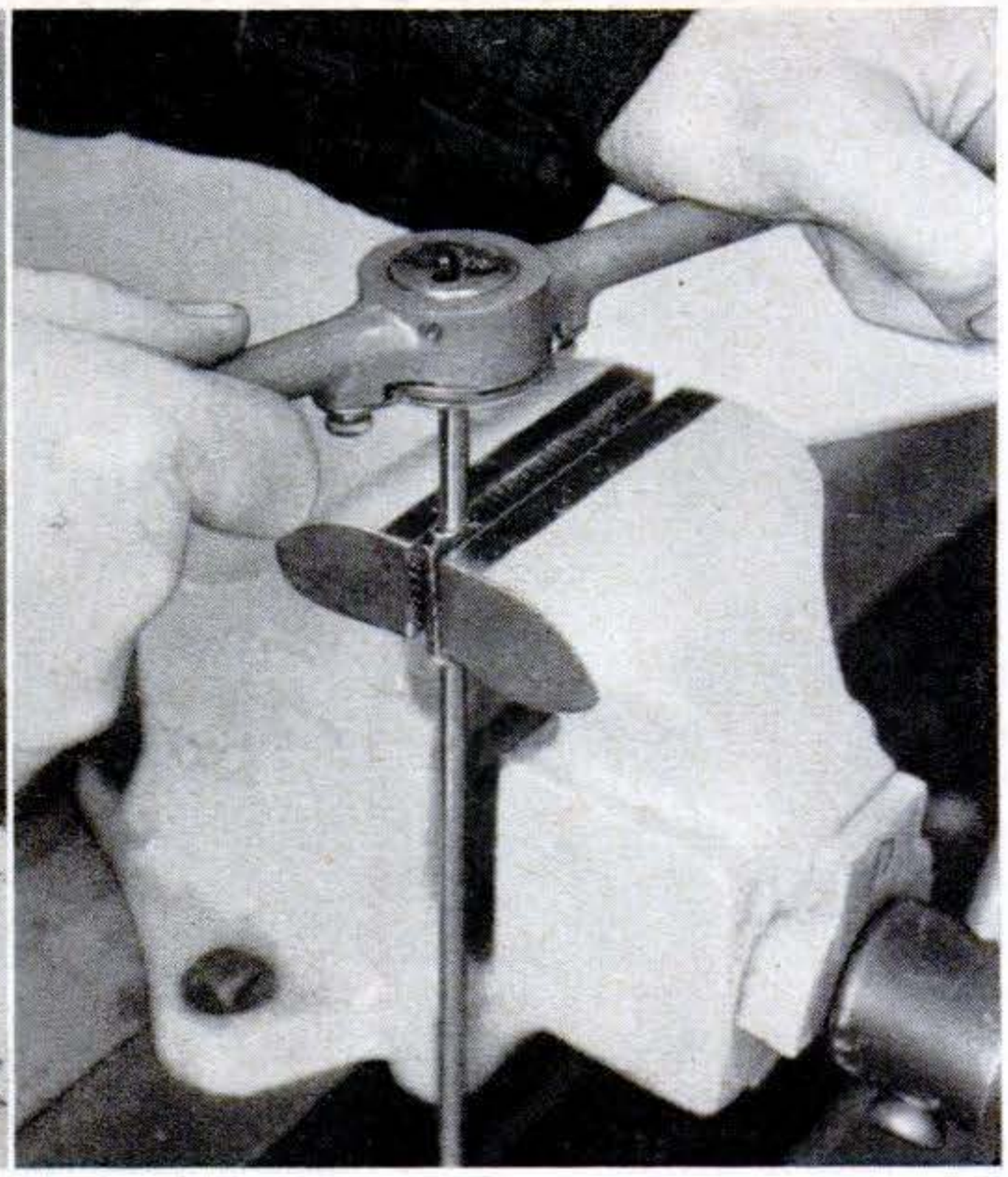
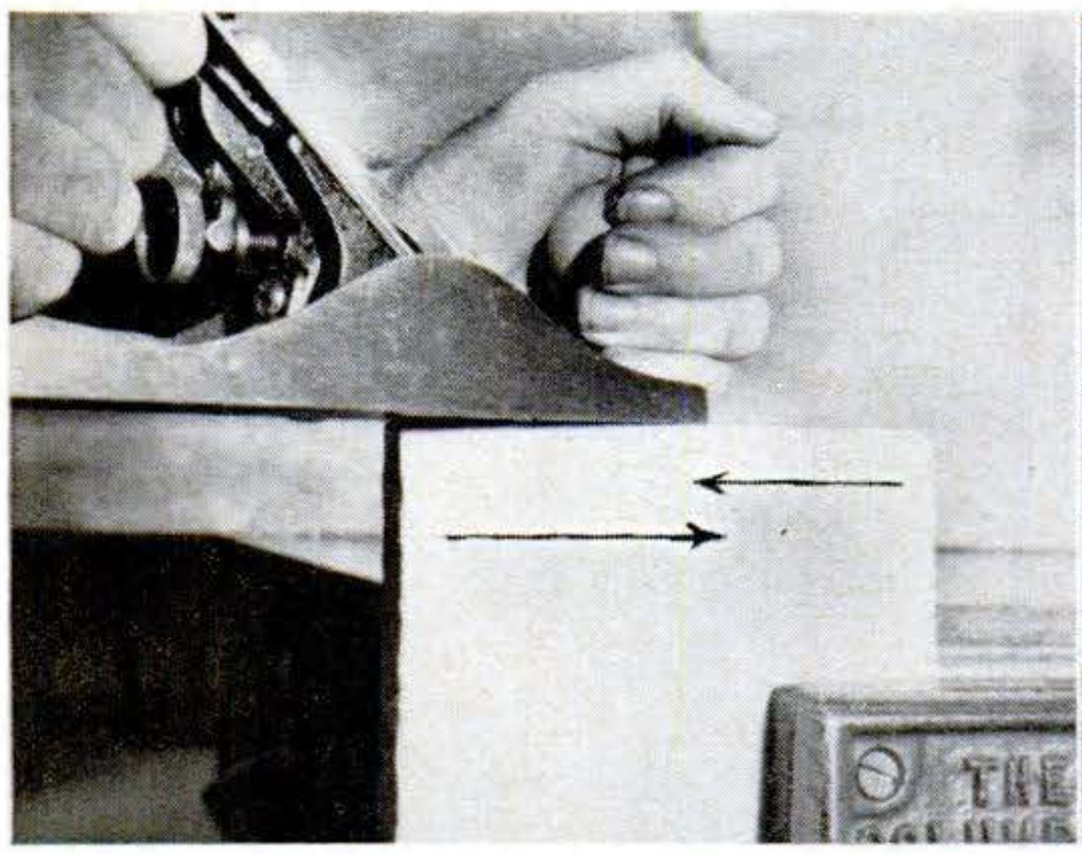
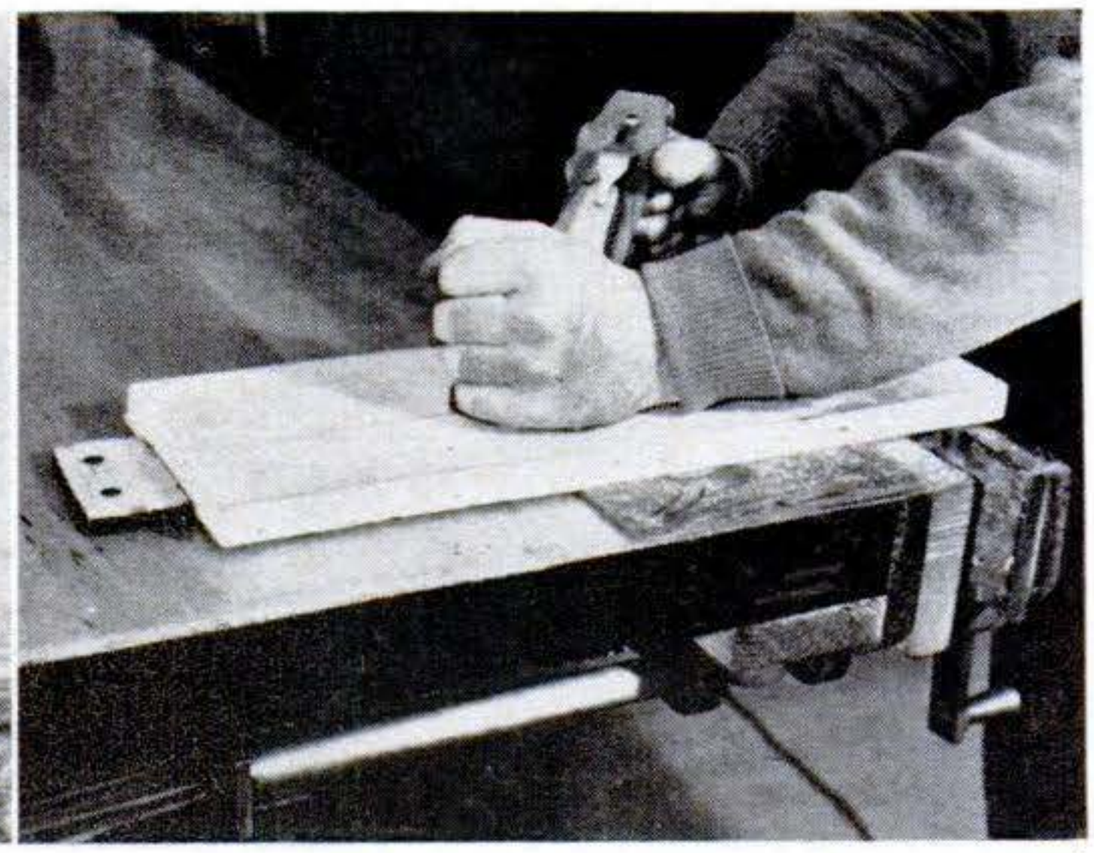


8 RIVETING AND HAND-FORGING: Some vises have an anvil cast as a unit with the screw housing. Use this for riveting and hand-forging soft metals. A word of warning: The anvil isn't tough enough for ferrous-metal forging.



9 WORKING DRILL ROD: Wrap a small strip of thin metal around drill rod that must be held in a vise for sawing, bending or, as shown here, cutting outside threads. That way you won't damage the rod with the vise jaws.





10 PLANING WOOD: Prevent splintering when end-planing a board by planing toward the center from the edges. Place the board so you plane *toward* the vise, as above. Reverse the setup when you plane the remaining part of the end. Metal stop on the front jaw of most wood vises is handy for face planing. If you don't have a bench stop to grip the far end of the board, clamp or screw a piece of wood to the bench top to keep the board from moving.

sight you can often make one setup do for a number of tool operations.

Keep the vise cleaned and oiled and, in the case of most metalworking vises, painted. Painting the vise castings prevents rust and makes cleaning easier.

A clean vise keeps the work clean and prevents grit on the jaws from digging into work surfaces. If you are using glue, don't let drops harden on the jaws; they, too, will mar soft materials.

Oiling should be light but frequent. The screw on a metalworking vise is often neglected because only the underside is exposed. Here the trick is to apply oil to the threaded sleeve at the rear. While you're at it, lubricate the screw way and the friction area where the handle bears against the forward vise jaw. On woodworking vises, wipe the screw threads clean before oiling, to prevent a build-up of dirt and grit. END

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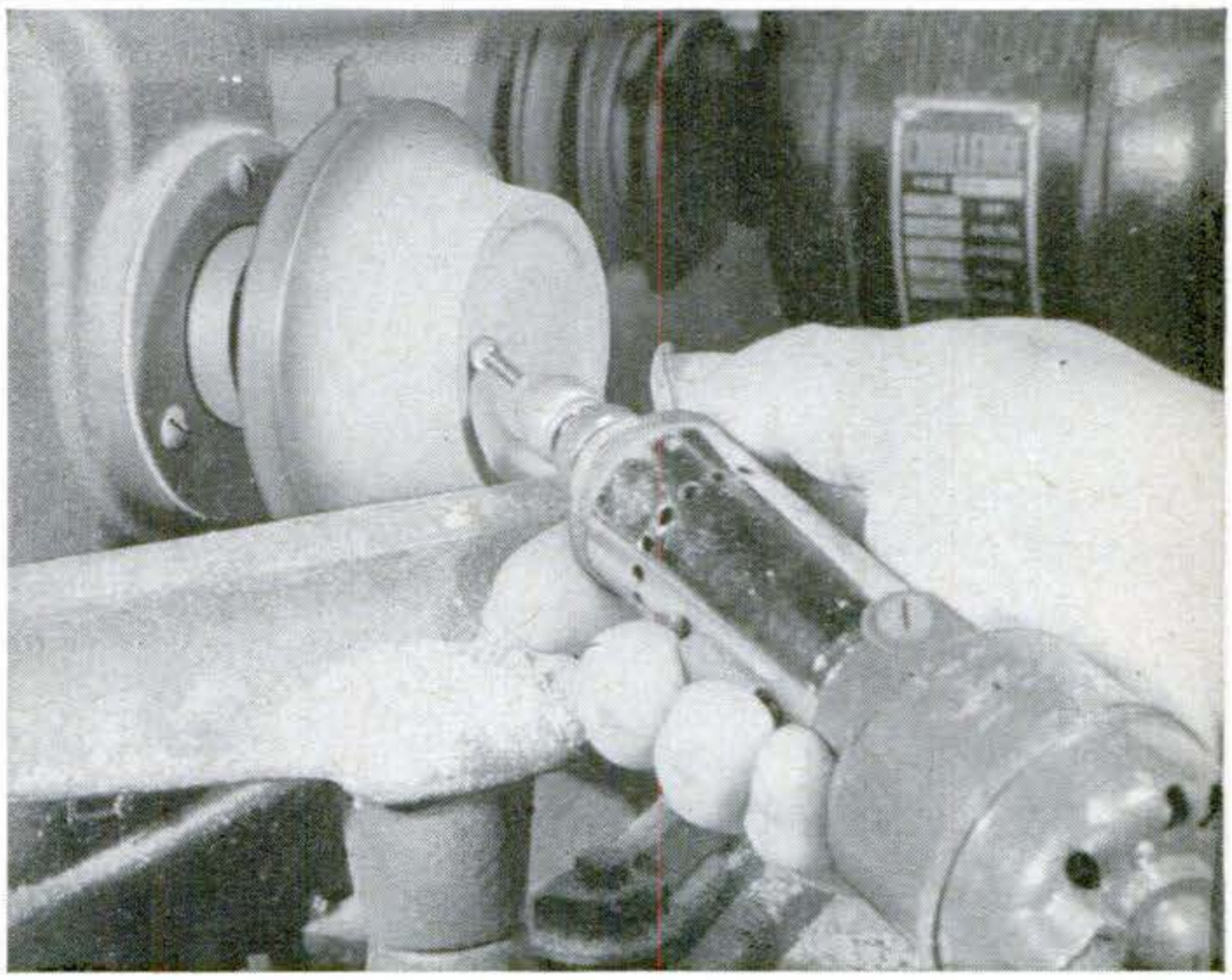
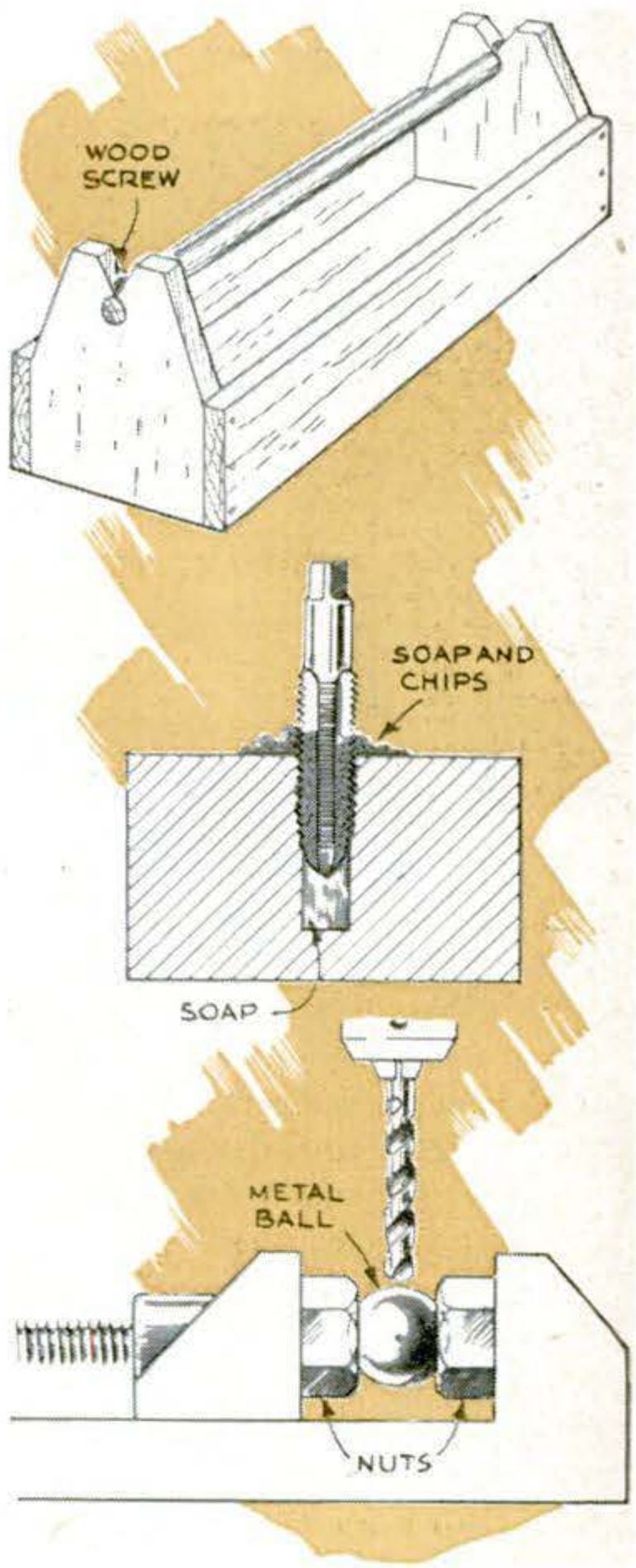


Try a high-speed grinder instead of a chisel for very smooth or intricate cuts when turning wood in a lathe. The rotation of a wood-cutting bit in a grinder used in the position shown is opposite to the rotation of work held on the lathe faceplate, and a smooth cut results from the combination of the two speeds. To maintain control and avoid gouging the work, take light cuts by rocking the grinder on the tool rest. —*H. Y. Moon, Orient, N.Y.*

Add to a tote box's usefulness by making V cuts in the end panels. It then becomes a long V block suitable for holding pipe or two-by-fours for cutting. Insert the handle of the box in holes bored beneath the V cuts and fasten it with a long screw at each end. Since cuts are made where the material *overhangs* the V block, sawdust or chips won't drop into the box.—*Roger Snook, Daly City, Calif.*



Avoid left-over parts, nuts and bolts when doing a repair job by taking a tip from the armed forces. The Army way is to lay out the parts on a board as you remove them, wash each one separately and put it back on the board, replacing any that are worn or broken. When reassembling, put the parts back in reverse order—last one out is the first back in.—*Albert Ujcic, Mexico City, Mex.*

Pack a blind hole with softened soap before you thread it. This dodge will enable you to cut threads to the bottom of the hole without stopping to blow out the chips. As you turn the tap into the hole, the soap is forced out, carrying the chips to the surface with it. The soap also serves as a lubricant, making threading easier.—*George Glavosek, Columbus, Ohio*

To grip a metal ball for drilling or machining, clamp it between two nuts of a size slightly smaller than the ball's diameter. This distributes vise pressure over a large area of the ball's surface and protects it from damage. The nuts also center the ball in the jaws of the vise, making layout operations easy.—*Robert Hill, Columbus, Ohio*

Please turn the page for more shop tips

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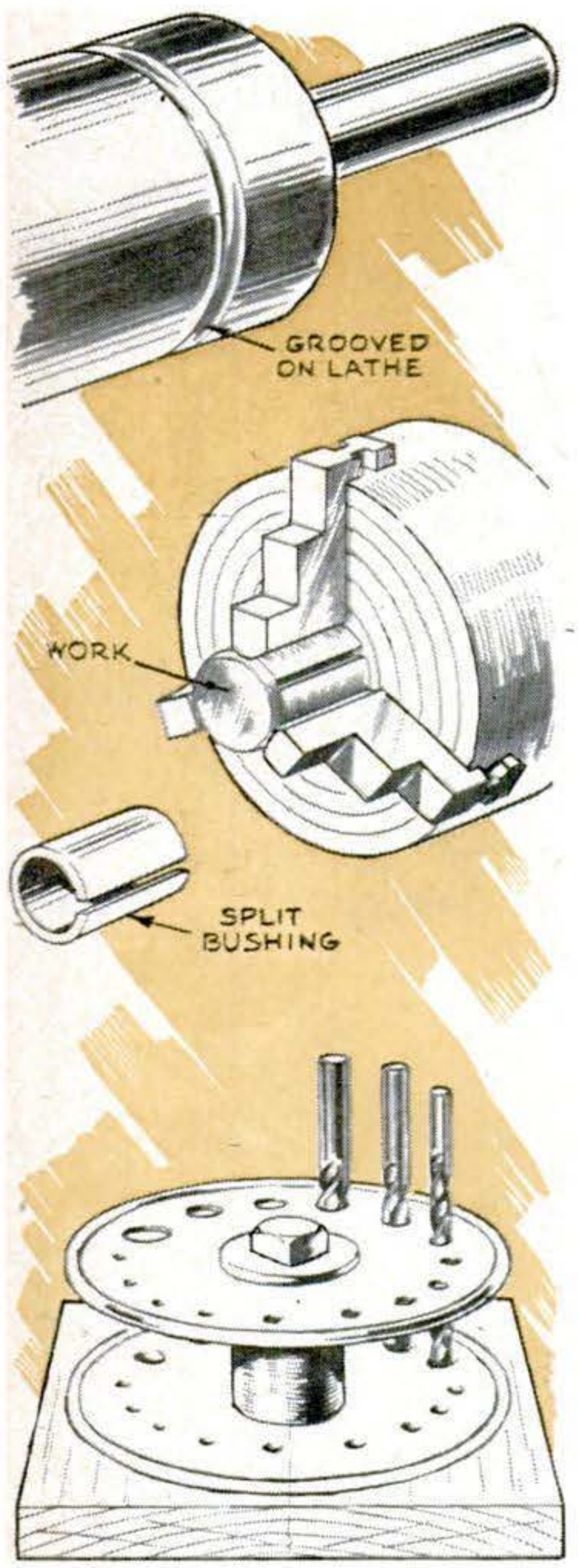

Turn grooves in round stock before making 90° cutoffs with a bandsaw. The blade will track in such grooves, producing cuts that require very little facing to smooth and bring to size. Gripping the work in a vise keeps it from turning while it's being cut.—*Frank LaSaracina, NYC*

A folding rule will open and close smoothly if the joints are occasionally lubricated. One woodworker applies liquid furniture wax to each joint, then flexes the rule to distribute the wax before the solvent evaporates.—*Walter E. Burton, Akron*

Easy way to seat washer-like work in a lathe chuck for facing is to back it with a slotted bushing. Turn the bushing slightly larger than the work and square it to a length that admits just enough of the disk for the jaws to grip it. Then slot the bushing lengthwise so it will contract slightly as the jaws are tightened. Save the bushing for future jobs of a like nature.—*H. J. Gerber, Stillwater, Okla.*

Soldering outdoors in cold weather is often difficult because the chilled solder draws the heat from the iron. One TV repairman hammers the solder into a thin ribbon to make it melt instantly on the iron's tip.—*J. A. Stock, Philadelphia*

A rotating drill holder can be made by loosely bolting an empty adhesive-tape spool to a wood base. Holes through the spool's top flange and punched indentations in the bottom flange make the drills stand erect.—*Frank L. Rush, Columbus, Ohio*

HAVE YOU TRIED THIS?

Adhesive tape helps in tight spots where you can't use both hands to start driving a wood screw. Push the screw part way through the sticky side of the tape, insert the screwdriver in the head slot and fold back the tape to grip both the screwhead and blade. After a few turns to start the screw, you can rip off the tape and drive the screw home.—*Bil Toman, Palatine, Ill.*

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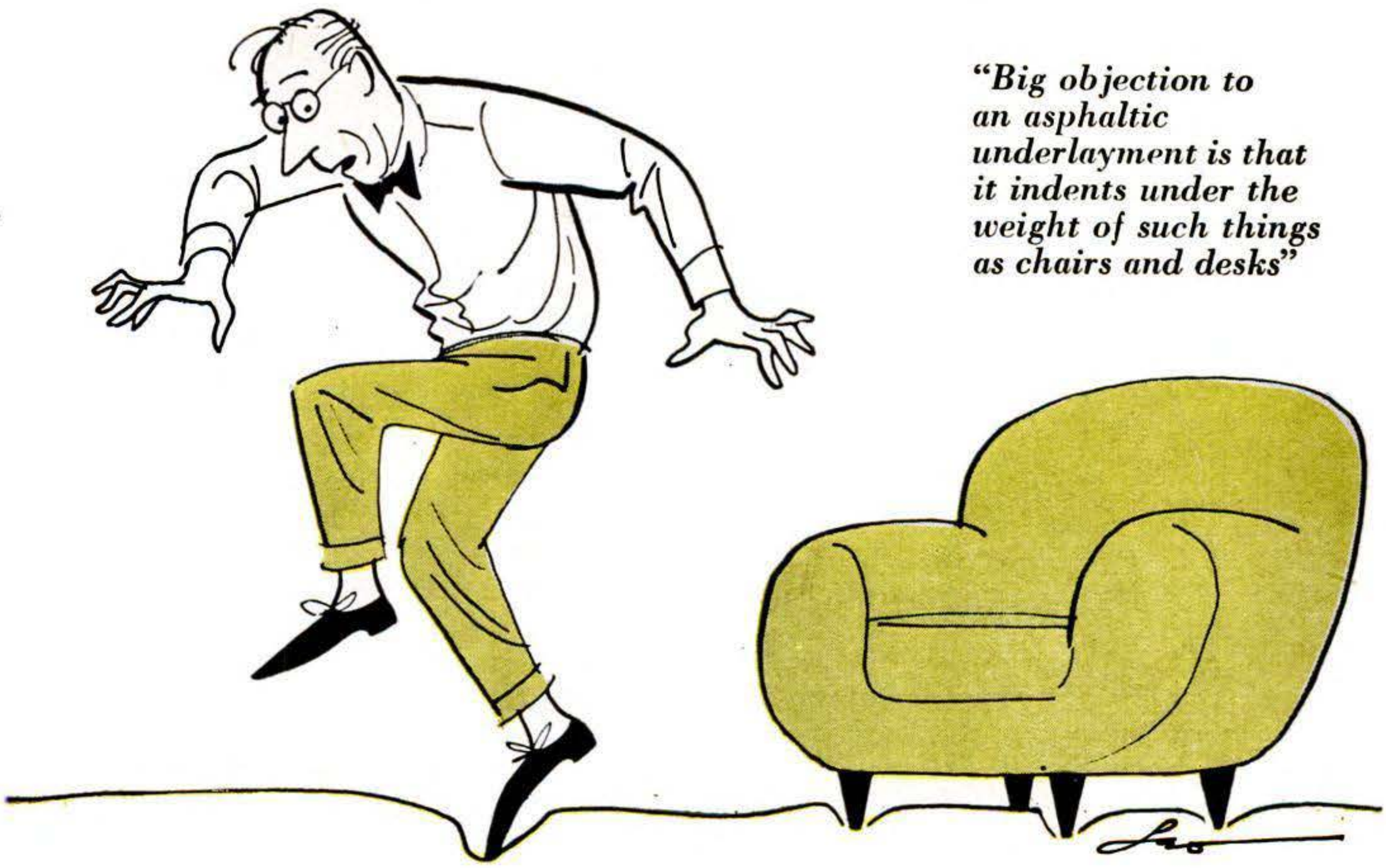

"Big objection to an asphaltic underlayment is that it indents under the weight of such things as chairs and desks"

A good base comes first. Here are the facts about:

Leveling a Floor for a New Covering

By John O. Bock

LAYING a floor covering on a poorly prepared base is asking for trouble. However smooth it may look at first, you'll see it disintegrate under your feet. A rough, uneven or loose underfloor can only result in abnormal wear, cracking and regrets.

A smooth underfloor is more important now than it used to be; floor-covering manufacturers are producing thinner and more pliable materials. The grain of plywood will show through some new light-gauge coverings. And even the heavier coverings such as standard linoleum and ⅛″ tiles need a smooth base. Any thermoplastic material—one that softens under heat or hardens in cold—will, in time, conform to irregularities underneath.

A sound underfloor is as vital as a smooth one. Most floor coverings harden and become brittle with age. If there is movement along the joints of the underfloor, cracking or crazing is likely to occur in the covering; loosened nails will protrude.

Whether you plan to put down the covering yourself or have it done by a professional, you ought to know how an underfloor should be prepared. Basically, it must be firm and smooth. Whether this is accomplished by sanding, overlaying with plywood, leveling with an underlayment, or a combination of these, is determined by the condition of the old floor.

In almost all cases some type of filling or patching material will be used. A knowledge of these materials and how and where they are best used is basic to a good job. Essentially, four types of underlayment are now in use—gypsum base, latex, asphaltic and oxychloride cement.

Gypsum-base underlayment is the

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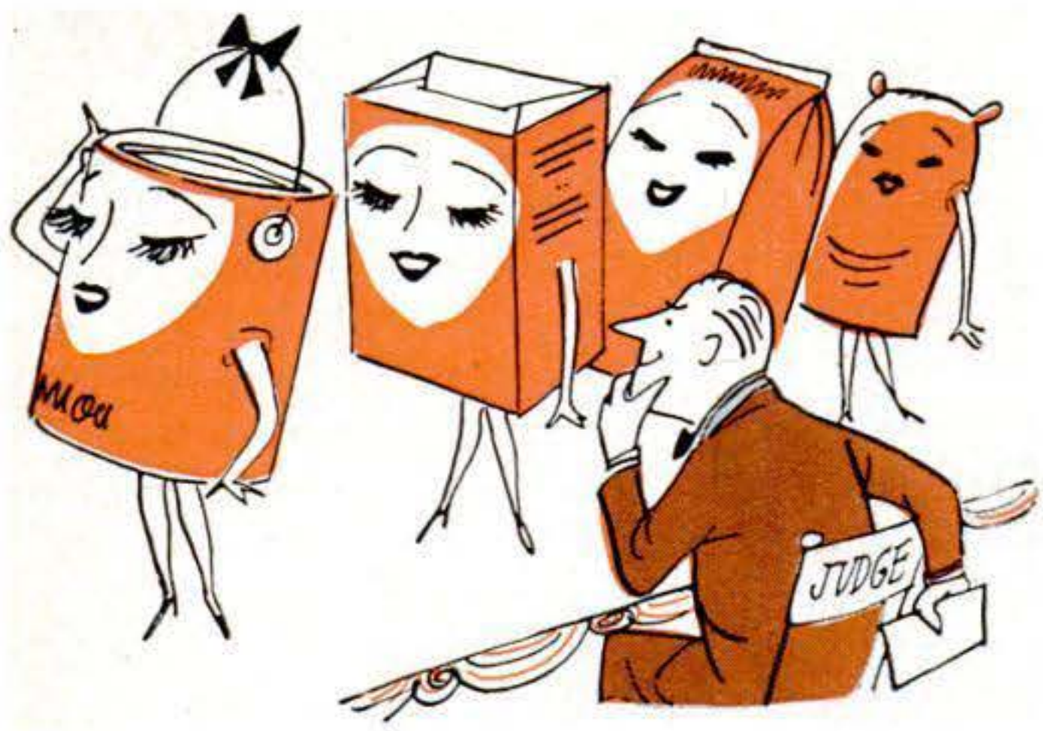

"Essentially, four types of underlayment are now in use—gypsum base, latex, asphaltic and oxychloride cement"

most common. It is packaged in powdered form and, when mixed with water, sets in about 30 minutes to a rock-hard consistency. It is ideal for filling cracks and knotholes or leveling small areas—but it does not bond too well to a slick or glazed surface. To overcome this, some manufacturers provide a liquid bonding agent that is applied first.

A pound package of gypsum-base underlayment costing about 40 cents will do the average kitchen floor.

Latex underlayment is a white liquid resembling milk in appearance and consistency. It is a synthetic latex to which is added a powder consisting of a mixture of either portland cement or alumite cement and sand.

Floor-covering stores and building-supply houses usually have it in premixed packages containing the right amount of cement and sand necessary for a given amount of liquid.

This type is more expensive (about six or seven cents per square foot, per $\frac{1}{16}''$ of thickness) but has advantages to offset the higher cost. It will bond to any type of clean, dry surface, including glass, steel or ceramic. It is not affected by heat and can be used over radiant-heated floors.

Latex is especially valuable where sanding would weaken an old floor or where you don't want to raise the floor level with plywood. Latex underlayment also eliminates the need for felt paper under a floor covering—in fact, it's sometimes called liquid felt.

Mixing of this material is done by stirring the powder-sand mixture into the liquid to produce a paste about the consistency of mortar. This mixture can be screeded or troweled into place for deep fills. For a thin fill to smooth a slightly cupped or worn floor, the paste is usually applied in a scrape coat, using the edge rather than the flat of a trowel, and working in the direction of the run of the boards so that the trowel rides the high points. Normally, a latex underlayment is not used for fills deeper than $\frac{3}{8}''$.

Asphaltic underlayment is a mixture consisting of an emulsified asphalt and sand, and either portland or alumite cement. It is normally used to level rough or uneven concrete floors. It should not be used to level wood floors except where metal lath or wire mesh is first nailed securely to the floor as an additional bonding aid.

The chief objection to an asphaltic-mastic underlayment is that it will indent under the weight of such things as davenports, heavy chairs or desks. For deep fills where the mix can be bulked with rock, the problem is less severe. For large or deep fills over concrete, especially where indentation is not important, it is the most practical in cost: about 12¢ to 15¢ a square foot, per $\frac{1}{2}''$ thickness.

Oxychloride-cement underlayment is perhaps the best from the standpoint of hardness, light weight and resistance to heat and indentation. It resembles concrete in appearance and is troweled into place. Because of its high strength (approximately eight times the tensile strength of concrete) it can be used in thicknesses as low as $\frac{1}{2}''$. It has the flexibility, too, to withstand stresses developed by normal movements of subfloors without cracking.

Oxychloride cement—more often called magnesite—comes in two parts. One is a solution of magnesium chloride and the other a dry mix composed of caustic calcined magnesium oxide, filler and fine aggregates. The fillers can be asbestos, wood fibers, silex or others. The fine aggregates are usually crushed stone, sand or other similar inert materials. When the solution of magnesium chloride is mixed with the magnesium oxide, the reaction produces magnesium oxychloride cement.

Application of this type of underlayment takes skill and experience. The ingredients must be carefully controlled, and the setting time, affected by temper-

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ature and humidity, makes troweling difficult. Some manufacturers do offer a packaged unit for the home craftsman. But unless you're experienced in hand-troweling large areas, think twice before using magnesite for do-it-yourself jobs.

Underlayment board and plywood are widely used to level and strengthen worn and uneven wood floors. One objection is that they raise floor level, another that an uneven floor must still be leveled either by sanding or with a fill material to prevent deflection of the plywood over low areas. This is especially critical when thin plywood is used.

Panel-type hardboards are used because they have a perfectly smooth and grainless surface. Professionals, however, usually prefer plywood for its greater stability in damp areas.

Preparing the floor. The first step is to determine what is wrong with it. Tongue-and-groove flooring, found in most older homes, can present a number of problems—shrinkage cracks or buckled, cupped, worn or loose boards.

Testing for loose or worn boards is easily done by putting your full weight on individual boards and watching for movement. Check butt joints to make sure they have been nailed over a joist. If not, cut them back to the next joist and insert a new length of flooring.

Most cases will require only renailing followed by light sanding. Nailing is always done before sanding. Flathead screw-type nails are best because of their greater holding power. Set the nailheads and fill.

For sanding, use a drum-type sander in a direction parallel or at a slight angle to the boards. Edge sanders are available for finishing close to the baseboards. Both types can be rented.

It is advisable to apply a seal coat—shellac, varnish or the like—where an emulsion-type cement such as linoleum paste is to be used to lay felt paper or floor covering. Without it, moisture from the cement will cause dry flooring to swell, and the ridges produced will show through most resilient floor coverings. Unlike plywood, tongue-and-groove flooring should always have felt paper cemented to it before any floor covering is laid. An exception can be made when a latex underlayment is used over the entire floor.

An overlay or underlayment? Where a T & G floor has badly warped, cupped or worn boards, it is sometimes difficult to decide whether the best treatment is to overlay with plywood or resurface with an underlayment. A troweled underlayment will not strengthen a weak floor. If, after renailing, the boards still show movement when stepped on, then either a new floor or a plywood overlay is required. Where the flooring is sound, but warped or cupped, use a latex underlayment.

Plywood of the resin-bonded, exterior type should be used in bathrooms, washrooms or other areas where dampness is a factor. The requirement for thickness is that it mask any unevenness on the floor

"First step in preparing a floor for an underlayment is a thorough checkup to find what's wrong with it"

underneath. Thin plywood (1/4″ or 3/8″) should be laid only on a smooth surface, one that has been sanded and all low areas filled.

Should old linoleum be removed? Not if it is well bonded. The surface, however, should be sanded so that no trace of old wax or glaze remains. If the floor has sagged, use a latex underlayment. If it needs strengthening, a plywood overlay can be nailed over the existing linoleum.

Putting down plywood. Proper laying and nailing of the overlay is important. The sheets should be laid at right angles to the direction of the underfloor boards, with all joints staggered. Nail 5/8″ plywood 6″ along joints and 8″ on centers throughout the sheet. For less than 5/8″ thickness, nailing should be not over 6″ on centers and 3″ along joints. Use flathead screw-type nails not less than 1 1/4″ long. Sand all joints and use gypsum filler in cracks, knotholes and nail holes.

Concrete floors have their own problems. The most common are poor trowel-

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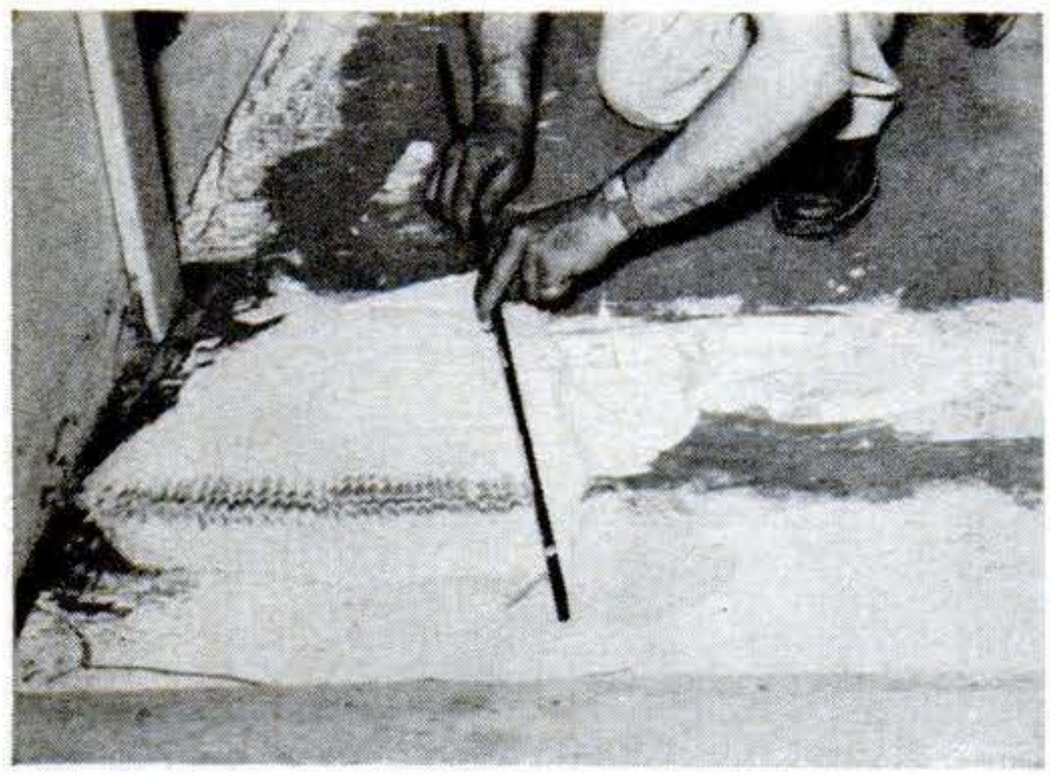
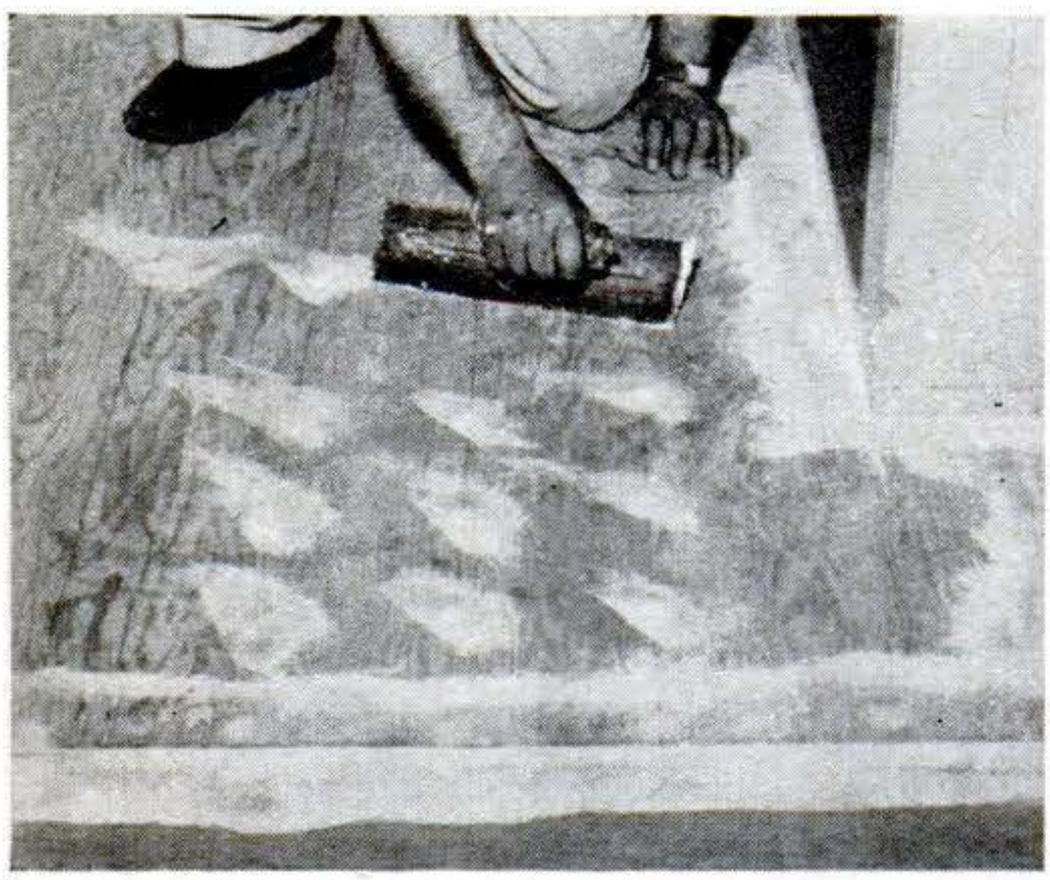
Steps in putting down and leveling a plywood base

CUT OFF DOOR CASINGS to allow clearance, before you lay plywood to strengthen a weak floor. A plywood scrap of the same thickness as your overlay makes a useful saw guide.



SCREED FILL MATERIAL into low areas on the old floor and let it harden before putting down plywood that's less than 5/8" thick. Use a hand trowel to smooth out any irregularities.



FILL CRACKS, SEAMS and all slight depressions before laying new covering. Plywood less than 5/8" should be nailed 6" or less on centers. Pencil lines on the plywood will give even spacing.

ing, paint or unevenness. Any of the trowel-applied underlayments can be used to level small areas or smooth slight roughness. For large areas and uneven floors requiring deep fills, use either a latex or an asphaltic mastic, which have a slower setting time, and permit screeding and working to a better degree.

Screeding is a method of leveling low areas between two high points by means of a straightedge. For best results the straightedge is worked forward with a seesawing motion. Repeat the operation two or three times to scrape off surplus material. Any slight ridges left behind should be removed by hand troweling after the underlayment has set slightly.

Paint should be removed from a painted concrete floor, especially if the floor is in contact with the ground or below ground level, where moisture will be induced by capillary action. Even on a suspended floor or a floor where a waterproof membrane has been used, the paint should be sanded off. A drum sander using a coarse open-coat paper does the job easily. END

Problem floors and what to do about them

FLOOR CONDITION	TREATMENT
Badly warped but otherwise sound	Sand lightly to remove ridges. Use latex underlayment
Sound, slight cupping. Or painted wood	Sand only. Seal with shellac, varnish or other sealer
Worn wood, thin and springy	Fill low areas with either gypsum or latex underlayment. Overlay with plywood
Shrinkage cracks, knotholes, seams in plywood	Use gypsum filler
Unsanded plywood	Sand or apply scrape coat of latex or gypsum underlayment
Pitted or poorly troweled concrete	Scrape coat of asphaltic mastic, latex or gypsum underlayment
Concrete, requiring fills 1" to 2" or more	Asphaltic mastic bulked with rock. Apply finish coat with rock deleted. Latex underlayment can also be bulked with rock for deep fills but cost is high
Painted concrete	Remove paint by sanding or use of special remover. Use latex underlayment if fills or leveling course required
Radiant-heated floors	If fill required, use latex or gypsum type
Buckled wood, caused by ground moisture and inadequate ventilation	Lay moistureproof membrane over ground, provide more ventilation, or both

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How to look and listen for:

Your Best Buy in Ready-Made Hi-Fi

By R. S. Lanier

NOW you can have the benefits of hi-fi without contracting the bug. It's no longer necessary to understand hi-fi jargon and assemble components to bring beautifully reproduced music into your living room.

All-in-one-box, ready-to-play hi-fi instruments have reached the market in volume this winter. Thirty or more firms now offer extensive lines of "package hi-fi," and James M. Toney, vice president of RCA, predicts sales of more than $400,000,000 during 1958.

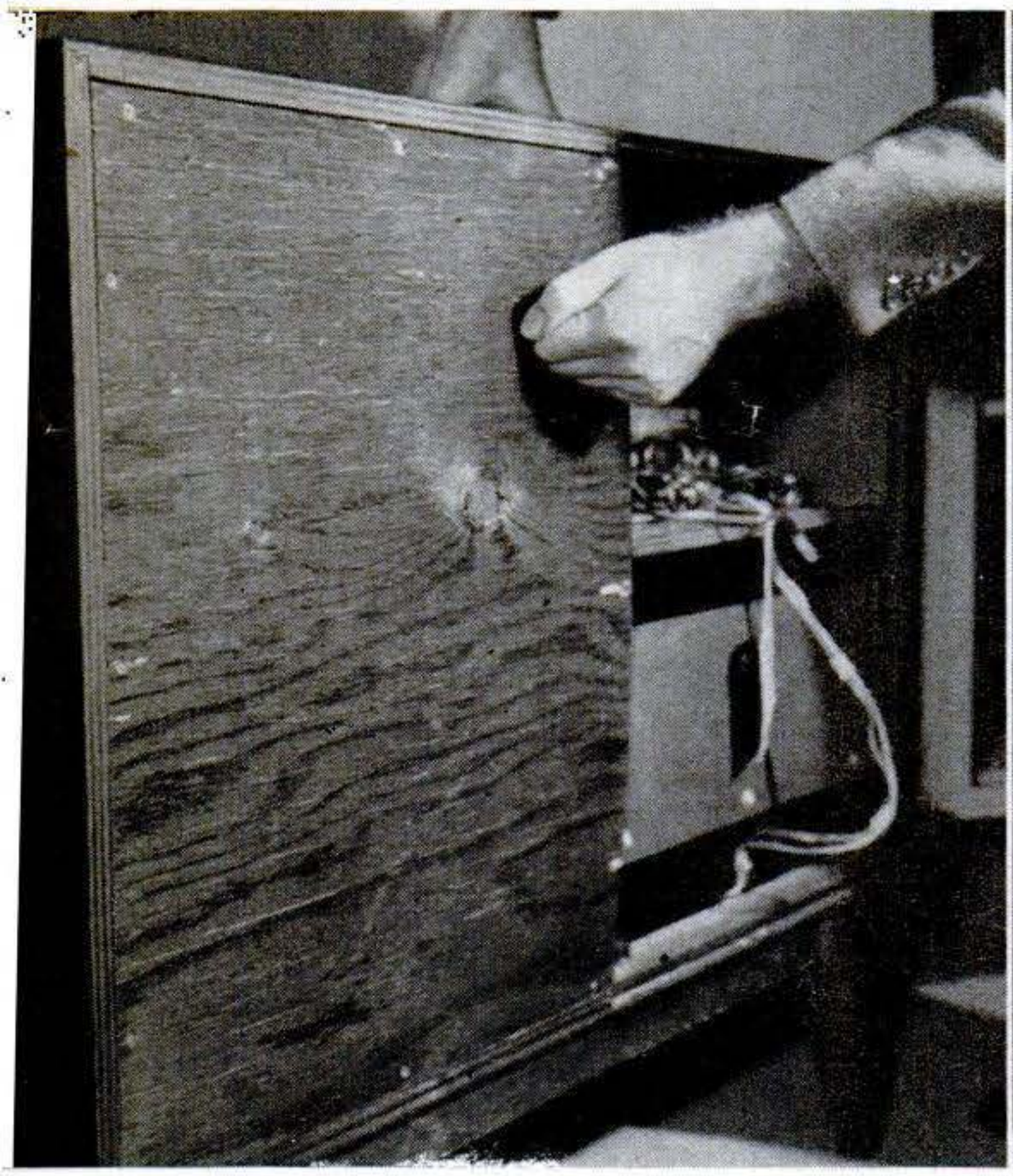
Package hi-fi looks something like the old home-phonograph or radio console. But the resemblance is only outward. After listening to some two-score of the new machines, I can assure you that a good measure of fidelity is built into these high-style cabinets.

Hi-Fi and Electronics

The man who buys packaged hi-fi should choose carefully among the new sets, however, and this article offers him some guideposts. "Buyer beware" must be his watchword. There is the predictable rash of shoddy stuff bearing a hi-fi label, and some machines have missed the goal because of misconceptions of the public's taste.

The higher the price, the more hi-fi you get. Quality, with few exceptions, is in proportion to what you pay. It is

To judge the quality of ready-made hi-fi, first play a familiar record on best rig in shop.



EXAMINE THE BACK of larger sets. Make sure the speaker chamber is tightly sealed by a heavy panel, and that the whole cabinet is solidly built, to avoid distortion from panel vibration.

CHECK THE CHANGER for workmanship and ease of operation. A four-pole motor, heavy turntable and rigid tone arm are quality marks. Collaro, above, Garrard, V-M are among the top makes.

impossible to manufacture a machine for $100 that is equal to a well-designed $400 model. You should realize, too, that you'll also pay heavily for a high-style cabinet.

Exactly the same *kind* of component units that enthusiasts buy in hi-fi salons are going in many of the medium- and higher-priced package sets. You find typical control systems, with record compensation, tone controls, and flexible selectors; power amplifiers of high power and low distortion; bass-reflex and horn-loaded loudspeaker systems.

Brand-name components familiar to all hi-fi buffs are used in many package sets: Garrard, Collaro and V-M changers, for example, and General Electric, Ronette and Sonotone pickups. The quality of such parts can be a good clue to the overall quality of a package set.

Packages aren't perfection. While true buffs are in an everlasting search for hi-fi perfection, the package sets avoid all ultimates. Two examples will make clear how you both lose and gain by their compromises.

One compromise concerns the choice between turntable or record changer. Among all the sets I examined, even the most expensive used record changers. The best changers available do a fine job—but there is a small, if very costly, advance in quality to be gained with a good professional turntable and a separate arm and pickup. This could add well over a hundred dollars to the cost of a set. To the hi-fi buff this is nothing; he gets not only fidelity but a chance to try new arms and various pickups. To the average buyer, shopping for price and convenience, the changer has more appeal, and set manufacturers give it to him.

It's the same with the second example of compromise: speakers. Except for one or two monster machines, ready-made sets are too small to house top-grade loudspeaker systems. A few outfits at well over $1,000 do have a large, separate speaker. (But such speakers are also too big, and too expensive, at $400 to $700 each, for all but a tiny minority of component hi-fi buyers.) Still, the cabinet space in many sets contains real speaker value.

Making your selection. Money in hand, you walk up to a shiny cabinet in the

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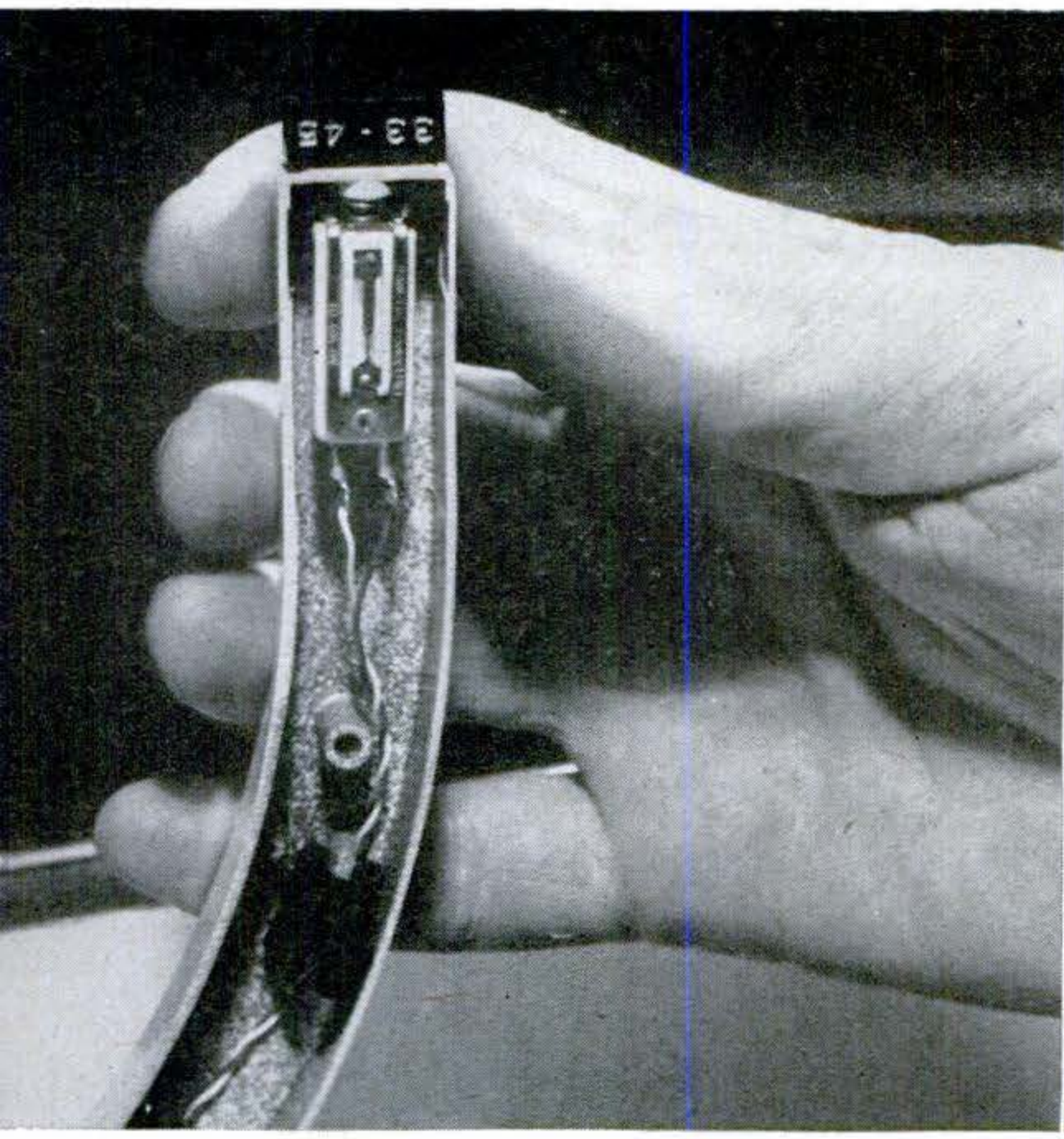
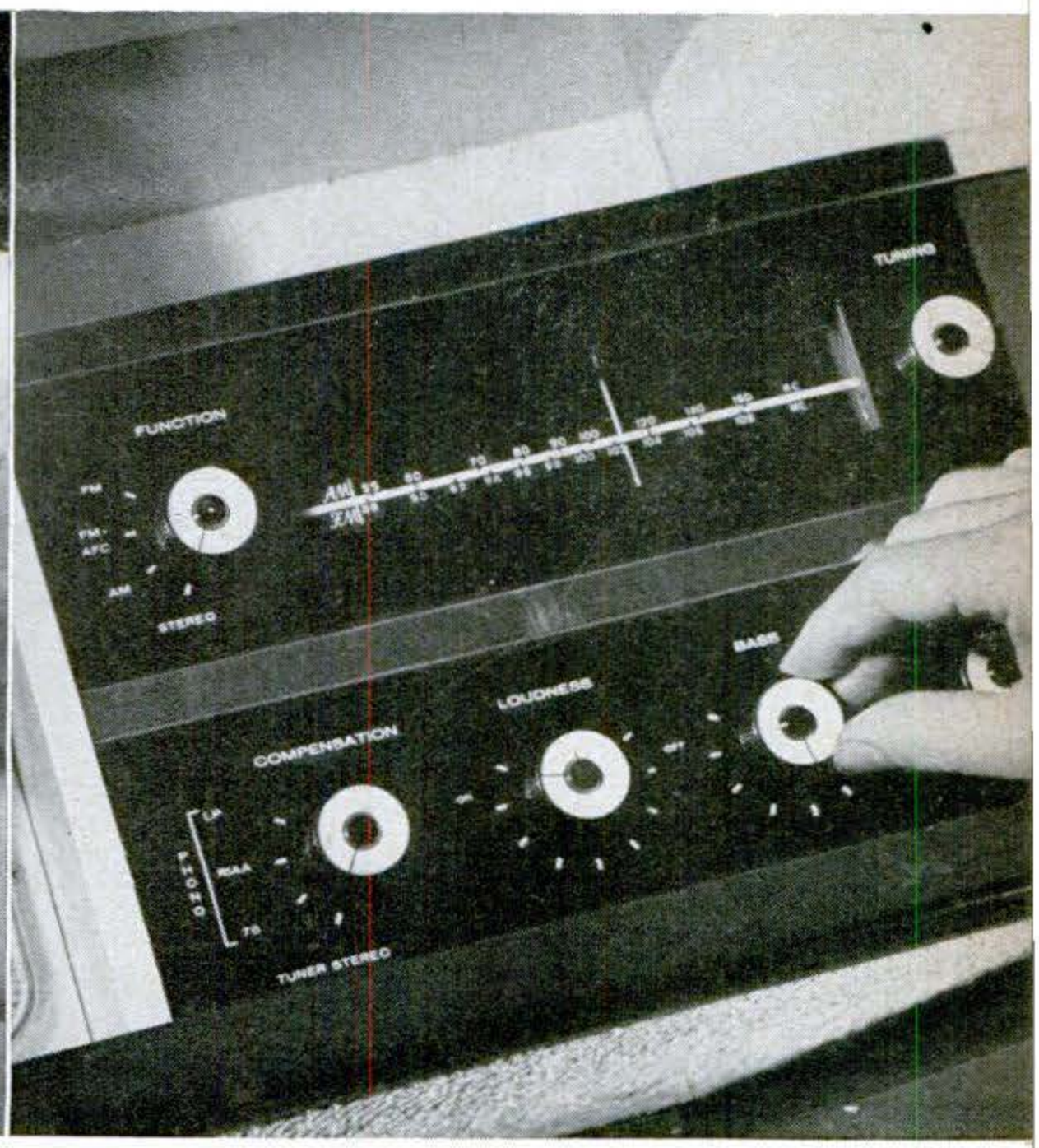


INSPECT PICKUP CARTRIDGE to see if it has a diamond LP stylus. Reliable Ronette (above) and Sonotone are widely used on better sets. Excellent GE magnetic is used on many of best rigs.



OPERATE THE CONTROLS YOURSELF. Begin with bass and treble controls in neutral position. Set volume for comfortable listening—not too loud. Check the effect of varying the tone controls.

Hi-fi features you can expect at various price levels

PRICE	PICKUP	CHANGER	AMPLIFIER	CONTROLS	RADIO
Below $125	ceramic (Sonotone or equivalent)	3-speed, fixed to case	4-6 watts (usually not stated)	volume, combined treble-bass	none, or AM only
$125 to $300	ceramic or high-quality crystal (Sonotone, Ronette or equivalent)	3-speed, floating (V-M, Monarch, Collaro, Garrard 121)	6-15 watts	separate bass and treble	none, or AM-FM; (radio adds $20-$75 to cost of comparable machines)
$300 to $600	magnetic or high-quality crystal (GE magnetic, Ronette or equivalent)	3-speed, floating (Collaro, Garrard 121 or Garrard 88, etc.)	10-25 watts	separate bass and treble, separate record compensator, volume	none, or AM-FM; (radio adds $50-$125 to cost of comparable machines)
Above $600	magnetic (GE or equivalent)	3-speed, floating (Garrard 88, Collaro or equivalent)	20 watts up	same as above	AM-FM radio nearly always included
	Plus one or more of the following features:	Very large loudspeaker systems in same or separate cabinet; Tape player and recorder for monaural and stereo; Pushbutton controls for record compensation; Visual monitors; Automatic clocks for turning on and off; Separate control to match speakers to room			

(Price divisions are approximate only and are intended to show general quality range. There are many individual exceptions.)

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music store, determined to take its measure. What should you do?

Make sure first that the cabinet is solidly constructed. Speaker performance is improved by every additional eighth-inch of panel thickness, especially when the same box holds the record-playing equipment.

On all but the smallest sets, the speaker should be fully enclosed by heavy paneling except for the small openings of the bass-reflex or similar system. The dealer can point these out to you.

The changer can often be identified by the label or its appearance. A Garrard, Collaro or V-M, for example, assures you of quality. On all but the smallest portable, the changer should "float" freely on soft springs to avoid acoustic feedback.

Everything work smoothly? Try dials, doors and other moving parts for smooth operation. If the changer is in a drawer, test the drawer for excessive play. A lift lid, with the changer support firmly attached to the cabinet, is usually preferable, but the drawers work well enough if carefully made.

General Electric, Ronette and Sonotone pickups are very widely used. All three are high-quality components. If you can't identify the pickup, you may get performance clues from a listening test.

The stylus for playing LP records should be a diamond, to avoid early stylus wear and record damage. Some of the less expensive sets come equipped with a sapphire, but a diamond can be installed at a small additional cost. It's advisable to insist on this.

A listening test is the separator. Prepare in advance by hearing a piece of music that you can later replay on the machine you're testing. Choose something like a piano concerto that includes loud, full orchestral passages, string passages and *very* slow piano playing. Get familiar with it, either "live" or by playing a record of it—perhaps a "test recording"—on the best outfit you have access to. This might be a top-grade components setup in a hi-fi salon or the most expensive machine in the music shop. Now you're ready to make a real listening test, instead of depending on an unfamiliar demonstration record.

Operate the machine yourself. Since the treble and bass controls affect the tone quality strongly, be sure they are set to "center" or "neutral" before you start. Some salesmen still tailor the tone to what they imagine the customer wants.

Turn on the machine and let it warm up. Then turn the volume control all the way up before you start your record, to see if there is excessive hum. Don't be disturbed by a *light* hum at top volume setting. But a loud, room-filling hum with the volume control in a normal listening range means a defective machine or a misleading hi-fi label.

Start the motor and move the pickup by hand back and forth above the surface of the turntable. The hum should remain at a low level for any position of the tone arm.

Put the stylus on the edge of the record and listen for heavy rumbling in the first few grooves before the music starts. A loud rumble, with the volume control in a normal listening range, means a cheap, noisy changer with excessive vibration.

If you are really familiar with your testing record, you will get sharp clues

Some "selling points" that do not help hi-fi

Specifications on frequency response

The measurement of the frequency action of a set is too complex to be stated in a set of numbers. Ignore frequency-response specifications. Honest manufacturers are forced to put them in to meet competition.

Number of loudspeakers

Ignore the number of speakers in a set. Two can be much better than four; it all depends on speaker quality.

That fourth speed on changers

That 16 2/3 r.p.m. speed is nonsense. If hi-fi ever comes in this speed, it will need better motors and pickups than are now found on changers.

Controls with fancy names

Names like "Timbre" or "Concert Setting" are tone controls. Good bass and treble controls will do all that can be done for tone balance.

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How to Order Popular Science Hi-Fi Test Record No. 2

The new disc, "True Sounds of Musical Tones," is available to PS readers at a prepublication price of only $2.50 for one, $4 for two, directly from Magazine Services, Inc. But order by Jan. 31. The price will go up Feb. 1 to $3.50 for one, $5 for two (still a special price for PS readers).

Hi-Fi Test Record No. 1 Is Still Available

You can still get the popular Test Record No. 1, which 50,000 readers of Popular Science have used effectively. It features sweep frequencies, sine-wave tests, tones for tuning speaker enclosures, a sound-effects quiz. The price (special to PS readers) is $3.50 for one, $5 for two.

To Order *Send cash, check or money order to Magazine Services, Inc., Dept. 1257, 104 E. 26th St., New York 10, N.Y. Local record stores that carry Urania records will also have them.*

to quality from the moment the music starts. In general, is the sound well balanced between bass and treble? If not, can it be easily balanced by adjusting the tone controls? Do violins *sound* like string instruments? What about the faint shivering of a dying cymbal crash? Does the kettledrum give a sharp "thwack" along with the "boom" when it is hit? Does the double bass march up and down the scale, and not get stuck in a one-note loud boom?

Checking for wow. If the pitch of the music wavers up and down giving an "over-the-waves" effect in *very* slow piano, violin, or organ music, you have a cheap motor that is continually changing its speed. The effect produced is "wow," one of the hardest faults to take in a sound reproducer.

Wow can't be heard with snappy, fast music. If your budget is very limited, you may have to accept a little wow on very slow passages of some records because a motor that runs at a perfectly even speed is expensive to make. Make a second wow test with a full stack of records riding on the changer table to make sure there is no slippage or other faulty operation at the end of a long series of automatic plays.

If the cabinet is not solidly made and the changer does not float freely, a heavy bass note may shake the pickup, and this shake sends a second heavy bass note to the speaker. This in turn shakes the pickup even more, and the dog-chasing-tail effect builds up to a roar or scream that can damage the machine as well as your eardrums. This is "acoustic feedback," a bad-quality mark if it occurs with bass and volume controls in a normal listening range. If it happens, turn the volume down quickly to save the machine.

Checking the radio. The same quality tests for sound apply to the radio, if there is one, as to the record player.

A point to note first, though, is that in the price range from about $200 to $450, you can often save from $20 to $75 by buying a set *without* a radio, assuming you don't want one. From about $500 up, a radio is usually included anyway.

As for testing a radio: On an FM set, does the noise between stations disappear completely over several degrees of the dial when you tune a station in? This is the test for sensitivity, showing that the radio pulls in a signal strong enough to "limit" the noise. If you live in a city near the FM stations you will have no trouble with sensitivity, but in a fringe area this could be important.

Male voices on the radio are a good test for the typical old-phonograph resonance. If the voices all seem to come from the bottom of a barrel, with no sharpness in the highs, the machine is pre-hi-fi in conception. Its "ringing" quality may seem deceptively mellow at first, but you'll tire of its limitations.

Finally, after listening carefully to several machines in your price range, pick the one *you* like, not the one your cousin likes, or the salesman, or the fellow in your office who knows all about hi-fi. A distinctly personal choice is the only way to get personal satisfaction from your package of hi-fi. END

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Intermittent TV troubles make you think you're nuts? Then read about:

The Psychiatrist Who Needed a TV Repairman

By Art Margolis

THE psychiatrist was on the couch. "Okay, Doc, don't get up," I said. "This the TV set you called me about?"

He nodded and got to his feet. "Try it," he said. I clicked it on. A perfect picture formed and the sound was fine. "What's wrong?" I asked.

He grabbed my arm. "Look, there's nothing wrong with it—nothing." A glassy stare came into his eyes as he whispered, "Nothing—except when I am—*alone*."

We get some queer ones in this TV-service business, so I shrugged that crack off and began checking the set, tapping it here and there. Doc went on talking, with the urgency of a man making a confession. "When my wife watches with me it always works fine. She doesn't *believe* there's anything wrong—with the TV."

I turned the set off. "You don't believe me, either," he said accusingly.

"Sure I do, Doc," I said, backing away. "But it looks to me like what you have is intermittent trouble."

He stiffened. "I beg your pardon?"

"Not you," I said hurriedly. "The TV set. What I mean by intermittent trouble

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TALES OF A TV REPAIRMAN

"When my wife watches with me it always works fine," the Doc said. "She doesn't believe that there's anything wrong—with the TV."

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is when there's a bug in the set that isn't always there. It comes and goes. Like you get a toothache and then when you get to the dentist's office and hear the drill, your tooth suddenly doesn't ache. Know what I mean?"

"That's very interesting." A gleam came into his eyes as he looked from me to his couch. "Have you ever been analyzed?"

I parried fast. "You took the word right out of my mouth, Doc. Analyze that set of yours, that's what I've got to do, but on a bench in my shop. If it's got a trauma—trouble, I mean—I've got to bring it to the surface, make it real, before I can fix it. Unless . . ."

"No, don't say it," he broke in. "Just take the thing away."

"I may have to use shock treatment," I said, picking up the set. Doc looked at me quizzically and then at his couch. I got out of there quick.

When I mentioned shock treatment I hadn't been kidding the Doc. In extreme cases, intermittents can be made to act up by subjecting the TV to a couple of its enemies—heat and overload. It has to be done with care, though, so as not to harm the set.

First I placed the set and a small electric heater in a cardboard box with a flap cut into one side. I turned them both on for a couple of hours. But nothing happened.

Next I attached a special variable-power transformer to the AC input so that I could vary the line voltage entering the TV. Slowly I raised the voltage from 117—to 120, 125, 130. At 132 there was a "pop," a loud buzz came from the audio, and the picture shimmered slowly from top to bottom. The "over" voltage made the defective filter condenser break down as it had been doing intermittently. It was letting hum into both the audio and video.

A quick check of the filters by putting another one across them located the trouble. I called the Doc up and he came right over. I showed him the good picture, and then reproduced the unfiltered, crazy-caper one. Doc gave out with a big sigh of relief.

"You know," he said, "that's just about what a schizophrenic might see when he has his—er—intermittent trouble."

No wonder the Doc had been worried.

A Picture of TV Trouble

THE story goes that McCorkle, our local photographer, takes double exposures to save film. I do know that to save rent he lives in the back of his studio—where I was surprised to find an expensive TV set.

"Cost me 25 cents in a raffle," he told me, "and now the dar-r-rn thing blur-r-rs up right in the middle of a show when they're giving the money away."

I had turned the set on and it was working perfectly. "I didn't see an antenna up on your roof, Mac."

"Natur-r-rally not. I'm hooked up to one the Olsons left next door when they moved away."

A cursory check indicated that I had another case of intermittent trouble. "Look, Mac," I said, "I'll take the set back to my shop and maybe run it for a couple of days."

He leaned over and switched the set off. "You're wearing the tubes out enough right now," he said, "and no doubt you'd char-r-rge me for the electricity."

Mac is a Scotsman.

"All right," I said with a grin. "The next time it starts blurring up, drag your camera in here and take a picture of it for me."

That was fine with Mac. A week later he called me back. His set had had an attack. I hurried over and he handed me a photograph. Sure enough, there was a bad blurring. The TV picture looked like wet ink that someone had smeared from left to right across the screen. I analyzed the symptoms as loss of high-frequency response.

In a television picture, frequencies

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from zero to over 4,000,000 cycles per second are on the job. When a spot on the TV screen changes from bright white to pitch black, it takes place at a speed of about 4,000,000 cycles a second. All the detail depending on these fast changes was smeared in Mac's photo.

Only one type of part deals directly with preventing the loss of high frequencies while the signal is being amplified: strategically placed peaking coils. In Mac's set it looked as if one of the coils was intermittently falling down on its job.

They all checked out okay on the ohmmeter. Next I tried to reproduce the photo by shorting and opening the peaking coils one by one. My third try did it. The screen picture matched the photo. I replaced the coil and wrote out a bill.

Mac looked at it and pulled out a worn purse. "You did a fine job, lad," he said, "and as a bonus I'm not going to char-r-rge you for-r-r the picture I took."

Case of the Cautious Customer

"NO, SIREEE! If you can't fix it here in my apartment where I can watch, don't bother."

I didn't bother. There was no sense wasting time explaining to Mr. Howell, a crotchety old bachelor, that the now-and-then loss of brightness in his TV picture was probably an intermittent that I'd have to watch for in my shop. He is well known in the neighborhood as the man who "doesn't trust a soul." Joe the butcher tells me that when Mr. Howell buys meat he checks the weight on all three of the store's scales.

Early one morning a few days later he called again. "Confounded set is driving me crazy," he said. "Come get it. But mind, I'm riding back with you."

He did, with one hand on his TV set all the way. In the shop it came on fine, as is the way with intermittents. I told him I couldn't do anything till the trouble started up. "I'll wait," he snapped.

Four hours later, hunger got the best of Mr. Howell. He went home to lunch. And that, of course, was when the picture brightness began popping on and off.

For a starter I began tapping the set, which may be unelectronic but does uncover bad connections. When I got near the horizontal-output tube I spotted a bit of sparking on pin number 8—the cathode. If this opens up it halts the flow of electrons in the tube. And as it is the heart of the high-voltage system, screen brightness is killed.

It was a quick fix. Some rosin in the solder of the pin joint had formed a blob under the surface, making the joint defective from time to time. I cleaned off the old factory solder with a soldering iron and applied a new bead.

When Mr. Howell came back and I told him that the set was fixed, he was furious—and suspicious. "How do I know you did anything at all?"

"You'll just have to trust me," I said and handed him a minimum-charge bill.

One day the next week I went into Joe's butcher shop for spareribs. Joe was putting down the phone. He wore a startled look. "That was old man Howell," he said. "Gave me a big order and—would you believe it?—said he'd *trust* me to send him the best buys."

Intermittent Imps Are Toughies

NOW you can understand why the very whisper of the word "intermittent" into the ear of a TV trouble shooter makes him shudder. Ghosts he can deal with, and run-of-the-mill video gremlins are reasonable creatures that can be run down and cornered by the book.

Not so the pixies that cause intermittent troubles. They have to play will-o'-the-wisp. You're about to put your finger on them, they vanish. You leave, they romp back, and the customer calls you a bum. Spend hours or days to track them down, send in a bill for your time, and you're a robber. Yet only patience and unorthodox techniques will snare these schizos of TV. A pox on them! END

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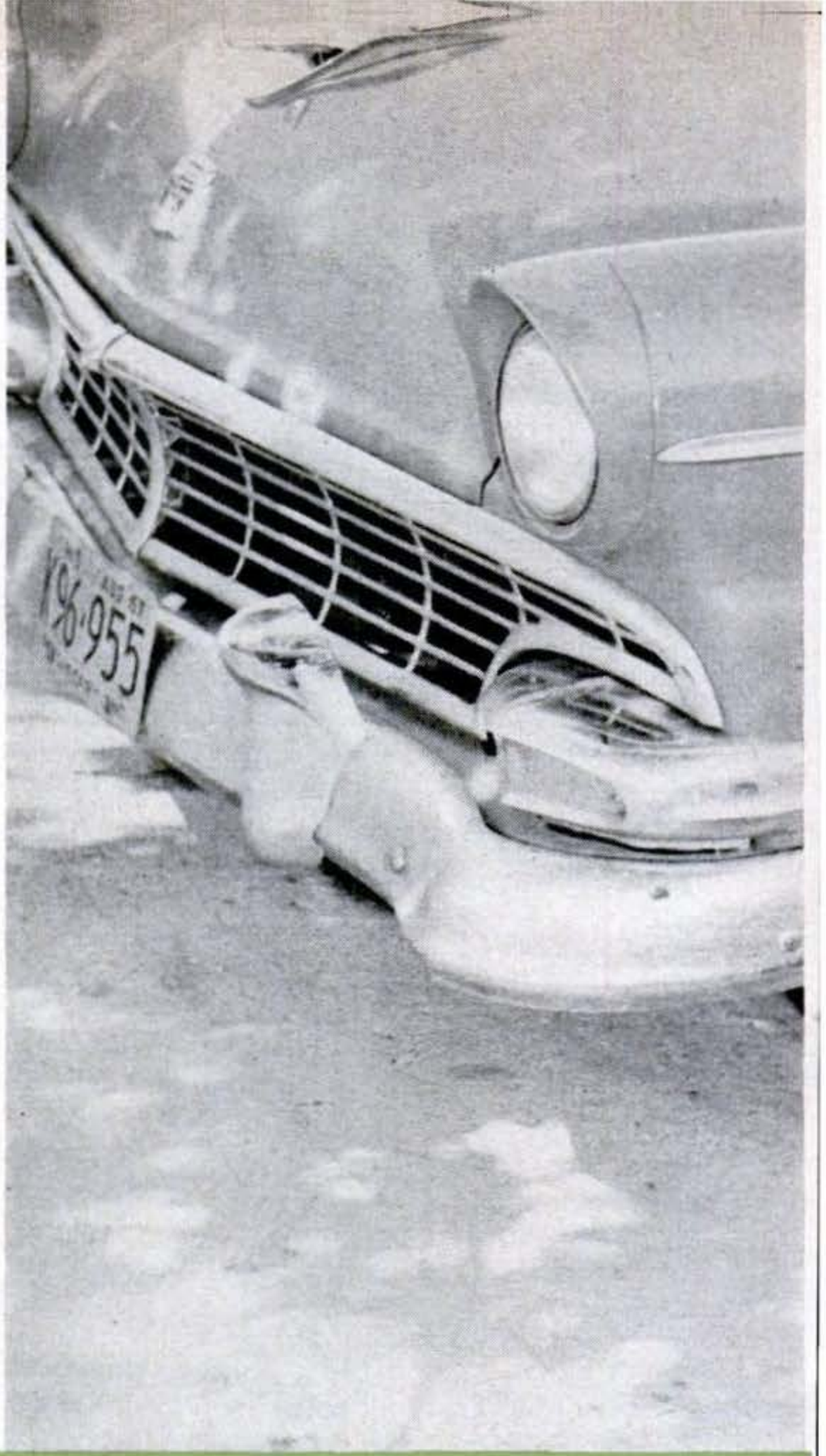
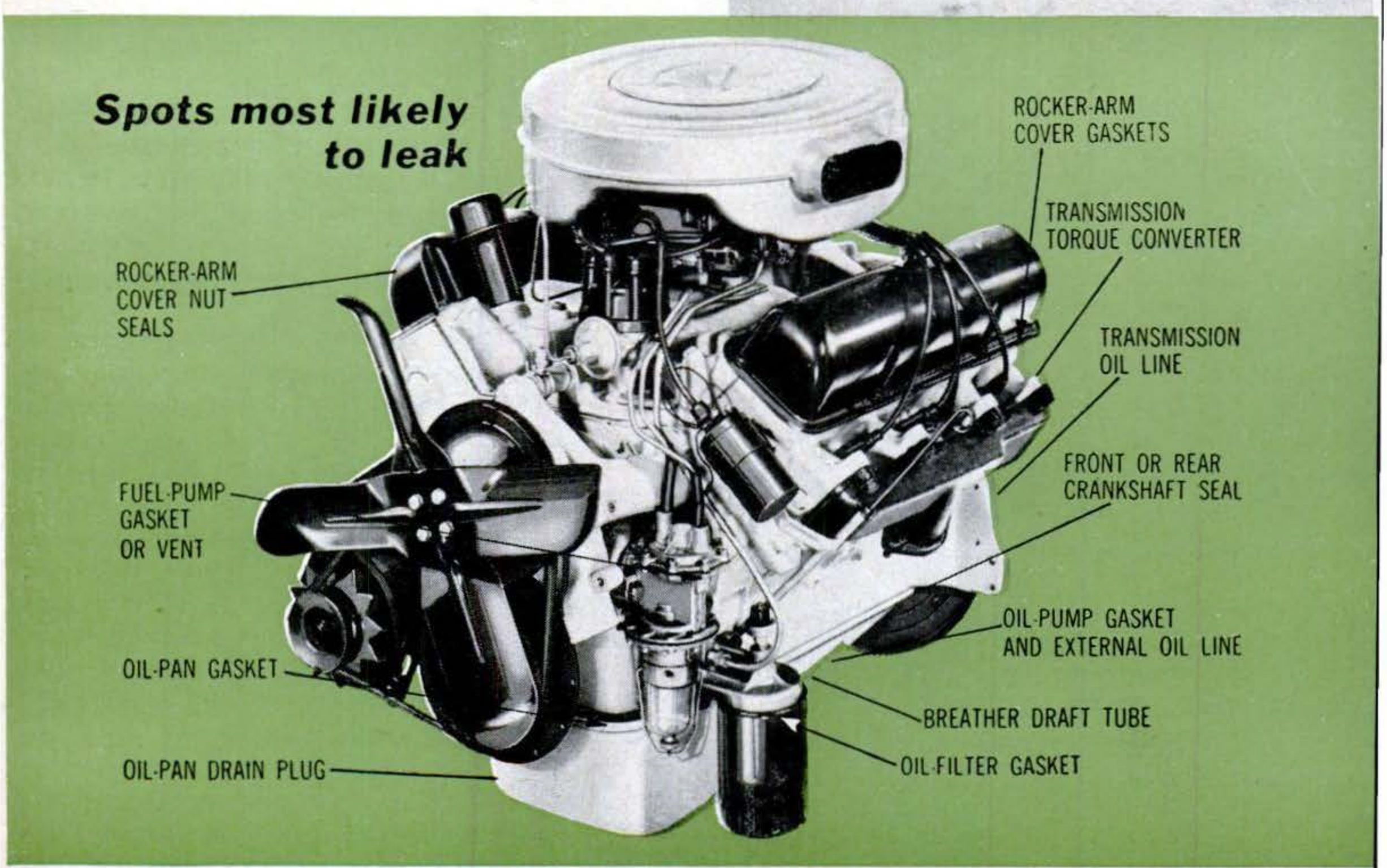
How to Hunt Down an Oil Leak



By E. F. Lindsley

IF YOU are reasonably sure that the piston rings, valve guides, and bearings of your car can pass muster, and it still uses more oil than seems right, the chances are good that oil is oozing from a leak somewhere.

This is bad for two reasons. First, no one cares to dig into his pocket to smear oil on the garage floor and highway. Second, and even worse, a small leak can suddenly grow big and ruin your engine or transmission. For example, a leaking gasket on a full-flow oil filter might drip innocently for months and then suddenly spout a gusher under



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A steady oil drip will probably show up on newspaper spread out underneath the car.

the pressure of hard highway driving.

To locate a leak, follow this procedure:

1. Spread newspaper or wrapping paper under the car and leave it overnight. Better still, run the car for 30 minutes or so with the paper underneath. Some leaks don't show up unless the engine is running and oil is under pressure.

If oil droplets show up, remember that their location on the paper may mean absolutely nothing as to the *leak's* location. A leaking rocker cover will dribble oil like oatmeal on a baby's chin and the actual droplet of oil may emerge down on the flywheel housing, looking for all the world like a main-bearing leak.

2. Take time to analyze the most likely sources of leaks and try to recall any recent service work that might have loosened a gasket, seal or line.

If a drop or two of oil appears under the draft tube (the pipe that is usually sliced off at an angle and appears to go nowhere down by the oil pan), no alarm should be felt. This tube is intended to ventilate the crankcase and naturally lets loose with a little oil vapor. An overeager salesman at the filling station may have sold you an extra quart of oil and some of this would be bound to go out the breather.

Many oil leaks are simply the result of excessive crankcase pressure because of breather plugging. Normally, piston blow-by and crankcase vapors escape through a road draft tube or other breather outlet, and fresh air comes in through the oil filler cap, usually filtering through a coarse material in the cap. Plugging of these normal openings with dirt, ice, sludge, packed snow, or whatever, will force the engine to open other exits for breathing. This could mean oil forced up into the distributor, out the rear seal to the clutch if one is used, or all over the fan belt up front. The cheap insurance

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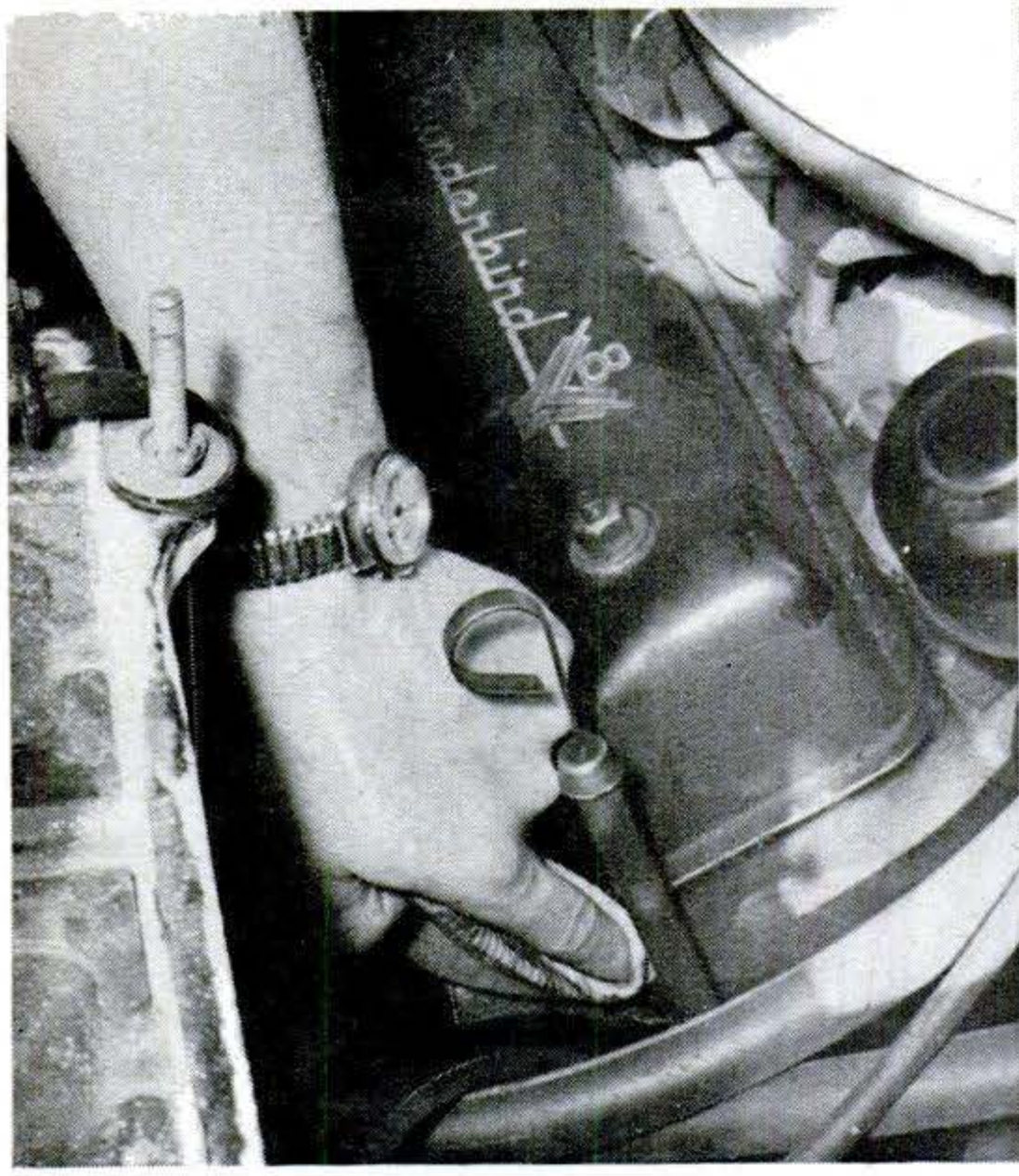
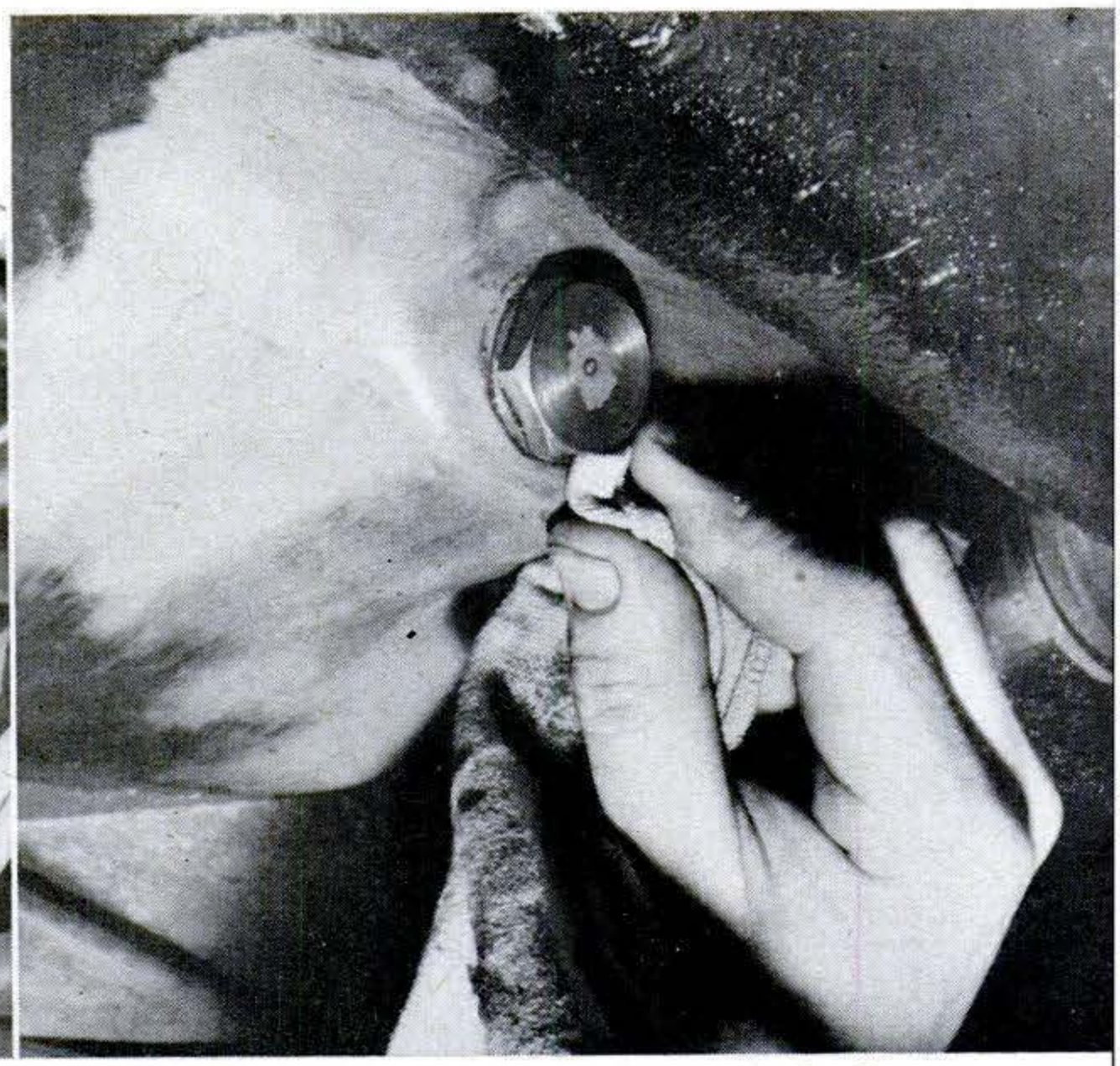
Cleaning suspected areas helps you spot leaks



WIPING ALL LIKELY SPOTS clean and dry is an important part of leak detection. Here the area around the rocker cover is being cleaned to see if recent removal for valve adjustment disturbed the sealing qualities of the gasket.



DRY THE CRANKCASE DRAIN PLUG and check it for looseness, cross threading, or a missing washer. Inspect it after you have the oil changed; a goof here could cost you an engine before you discovered the oil loss.

is occasional washing of the inlet breather and cleaning and checking the draft tube when the car is on the hoist for a grease job or oil change.

3. Clean all areas suspected of leaks. This may involve a certain amount of messiness, but where the source of the seepage is not obvious, it's the simplest method of leak detection. Wipe or wash all the suspected spots clean—enough so that a hard wipe will not soil your finger—and dry. If this is done carefully, you can later inspect by touch in such places as the back of the engine block near the rocker-cover gasket. If a leak exists it will show up as oil on your finger.

4. Drive the car for a short trip and follow up with a persnickety inspection of all the spots you cleaned. A bright flashlight, or a photoflood bulb in an extension light, will help a lot. Ten to one, when you locate the leak, the fix will amount to nothing more than a new gasket. Modern engines seldom have serious leaks at the rear main or the front crankshaft seal.

Automatic-transmission leaks. One problem has arisen with the use of automatic transmissions. This involves the big question of whether a leak back in the flywheel area comes from the engine or the transmission. Gear grease is obvious, but torque-converter oil looks much like engine oil. Quite often you can smell the difference, the general tendency being for Type A transmission oil to have an acrid and gamy odor. If you can tell the difference between the two by smelling the dipsticks, you can probably do the same thing by smelling the droplets from the leak. Any doubt here calls for careful professional checking.

Check the fuel pump, too. Another common source of high oil consumption is not exactly a leak—but neither does it represent an internal engine problem. Here, the vacuum-booster pump on the fuel pump works a hole in the pumping diaphragm and starts delivering oil through its discharge pipe into the intake manifold. A common symptom is a blue fog from the tail pipe.

Check by disconnecting the pump discharge line. Any oil in the line is cause for suspicion. Test further by running the engine with the line discharging against a piece of paper or into a bottle. The only cure for this is a new or rebuilt

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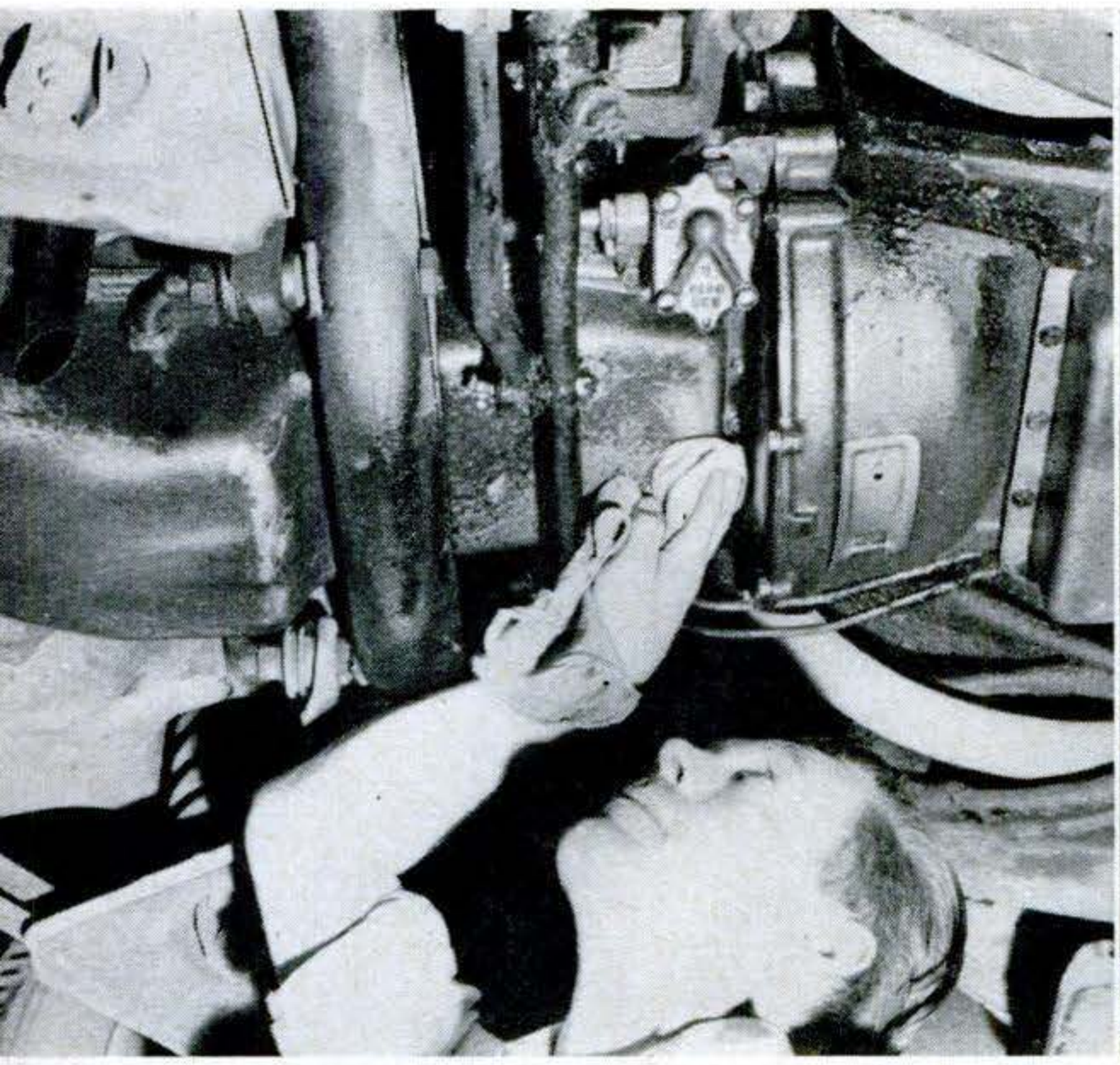
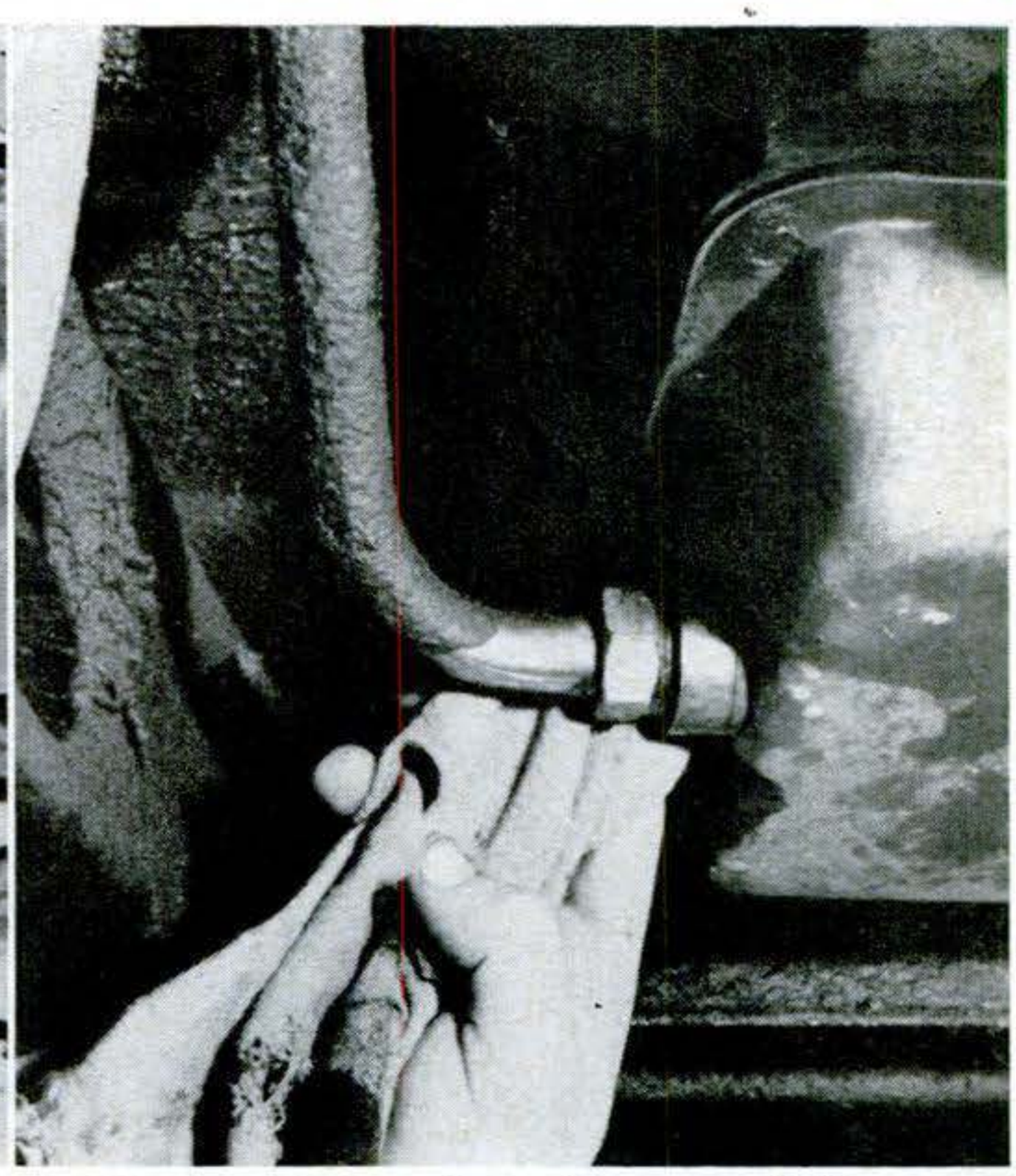
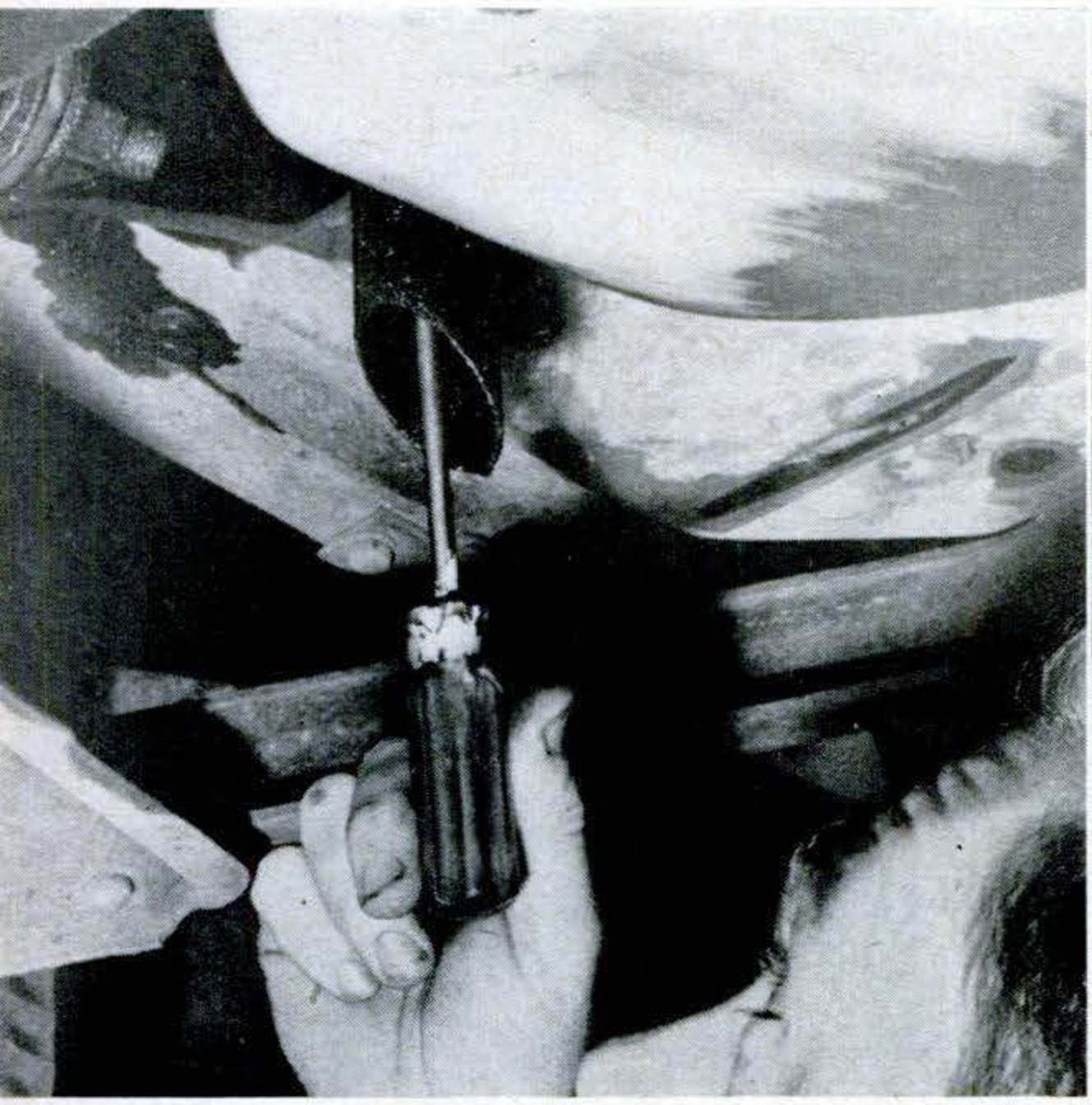


LEAKING OIL-PAN GASKETS or main bearings are uncommon in new cars, but quite common in cars that have been overhauled. Idle the engine while you are checking these, and take a careful look at the oil pump and filter.



EXTERNAL LINES such as this one, which carries transmission fluid to the radiator for cooling, should be checked periodically for damage from bad roads and flying stones. The connecting fitting shown here had a small leak.

Engine breathing can affect oil consumption



THIS SAWED-OFF PIPE, the draft tube, ventilates the engine. It will normally look messy, but poke a screwdriver in it to be sure it isn't clogged, too. Moisture can collect and freeze in this tube on short trips in winter.

BREATHER CAP on the oil-filter tube works with the draft tube to ventilate the crankcase. It should be washed in kerosene occasionally and re-oiled to insure free breathing and prevent build-up of vapors in the crankcase.

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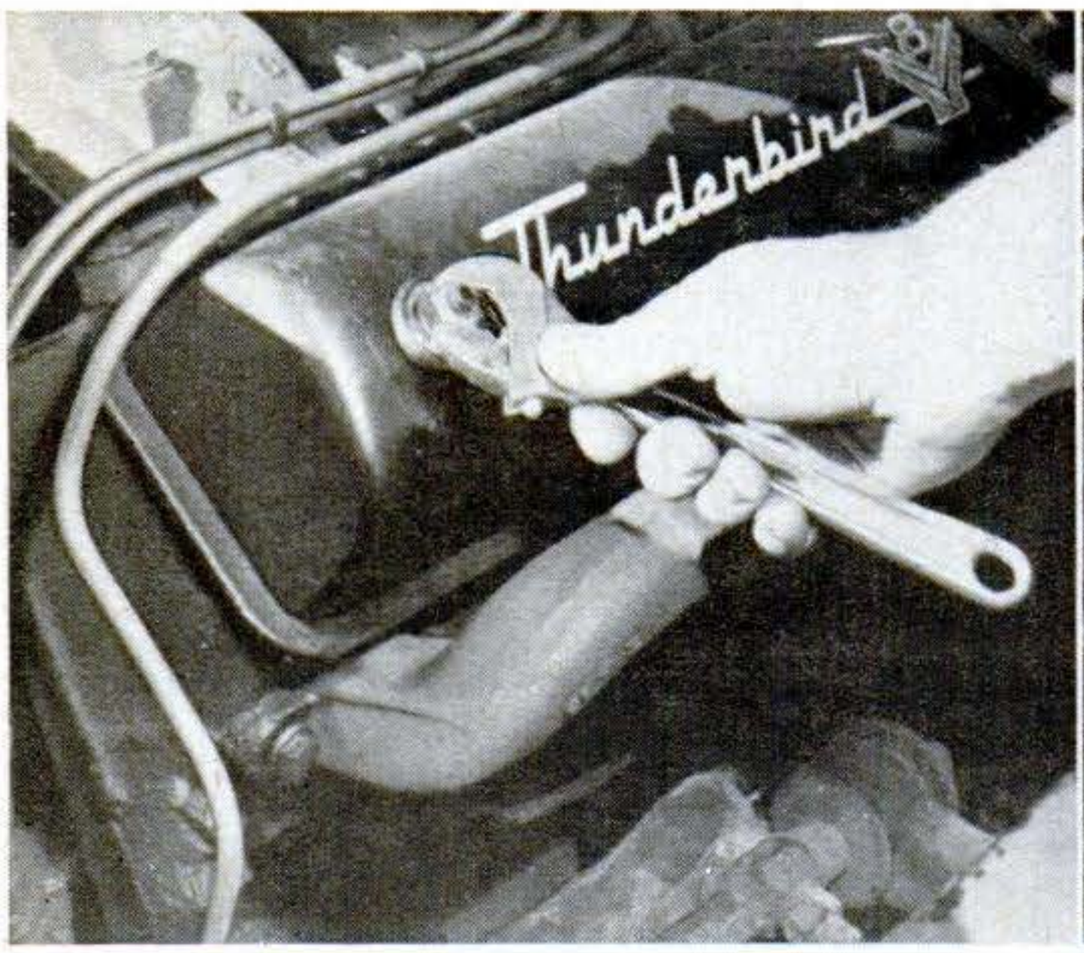
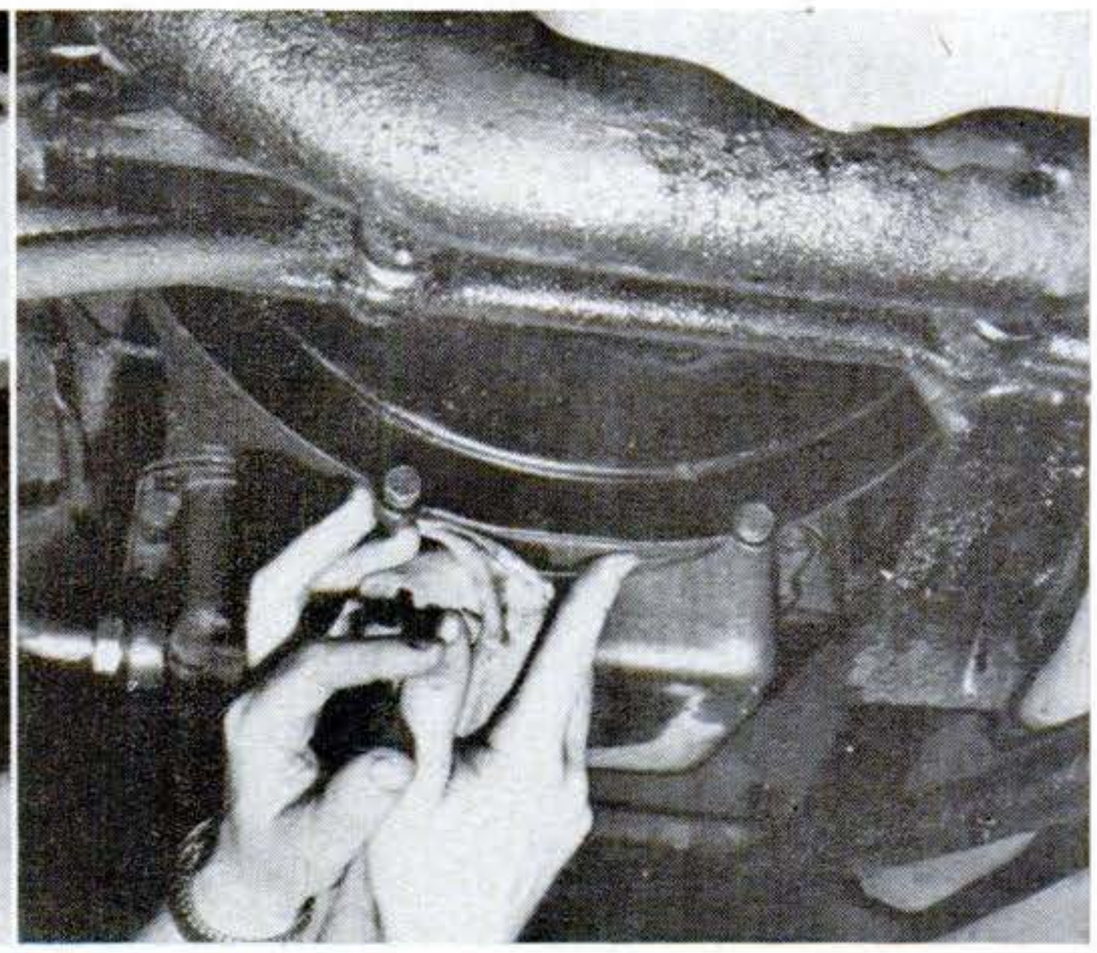
fuel pump, though some owners simply block off the booster if the fuel pump is okay and connect the windshield wiper's vacuum line to the intake manifold.

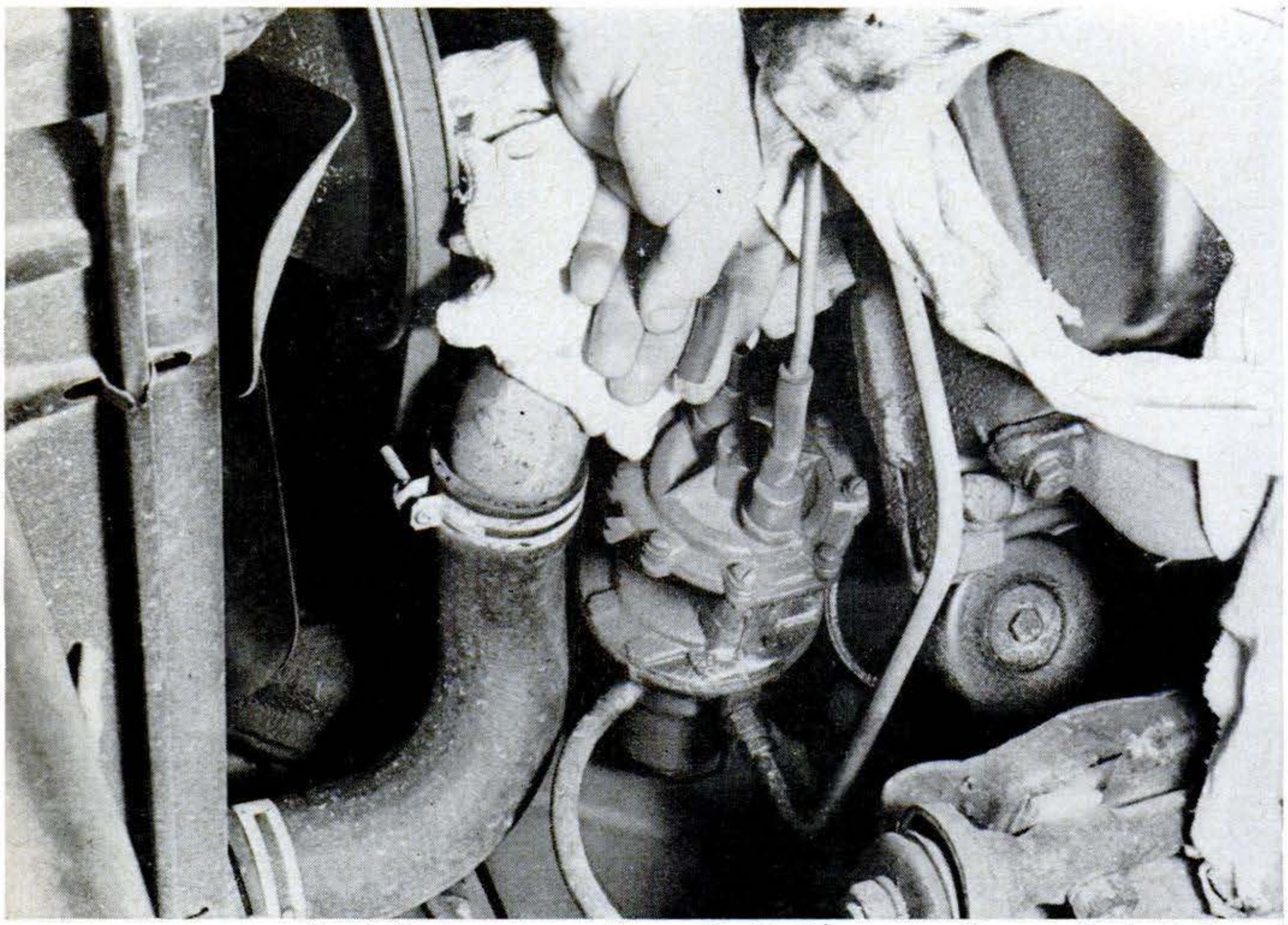
One comforting thought applies to leak hunting: It's a good thing to know where the leaks are, and to cure them if they can grow potentially serious; but from a practical standpoint, a half-pint of oil mixed with dirt and slopped all over your engine probably *looks* much worse than it actually is.



RUBBER SEALS under rocker-cover nuts sometimes let oil through after heat, age and pressure squash them flat. These seals as well as replacement gaskets can be bought at dealer's parts counter for a few well-invested cents.



AUTOMATIC TRANSMISSIONS can leak, too. Any droplets found on lower flywheel housing should be analyzed since loss of transmission fluid can be dangerous and—at 75¢ a quart—costly. Fluid smells different from oil.



VACUUM BOOSTER on the fuel pump can suck oil mist out of the crankcase if its diaphragm is damaged, then feed it into the intake manifold. Pull off the vacuum lines and check for oil inside. If oily, the booster must be repaired or pump replaced with a new one. END

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Police cars have to start in a flash—and go like the wind.
Nearly *twice* as many use Champions as any other plug!

Q. Why are nearly twice as many police cars in the U.S.A. powered by Champion spark plugs?

A. Champions give full-firing power. Put new Champions in your car every 10,000 miles. You'll get an *immediate* boost in horsepower...and save gasoline, too!

World's favorite spark plug on land, on sea, and in the air

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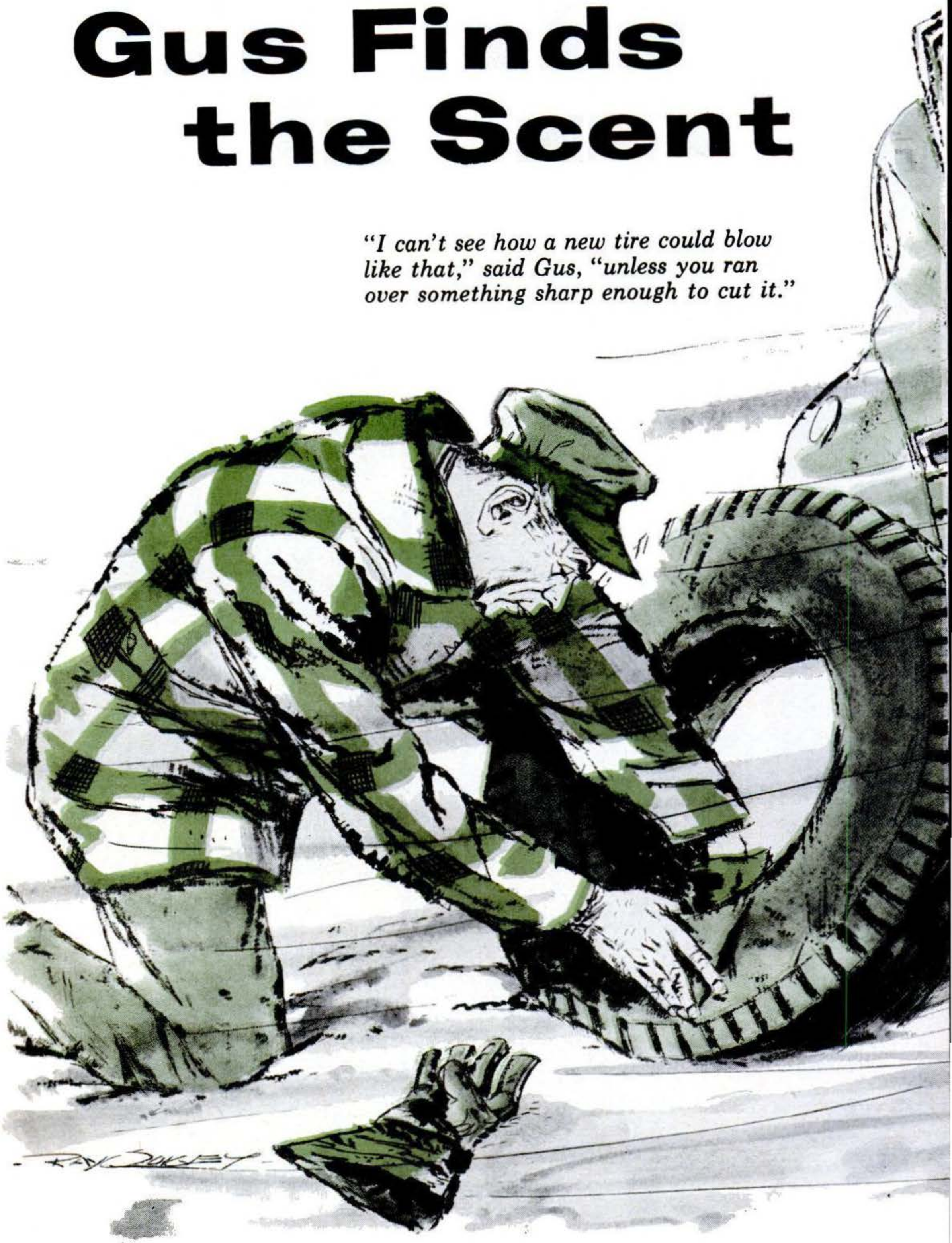
Gus Finds the Scent

"I can't see how a new tire could blow like that," said Gus, "unless you ran over something sharp enough to cut it."



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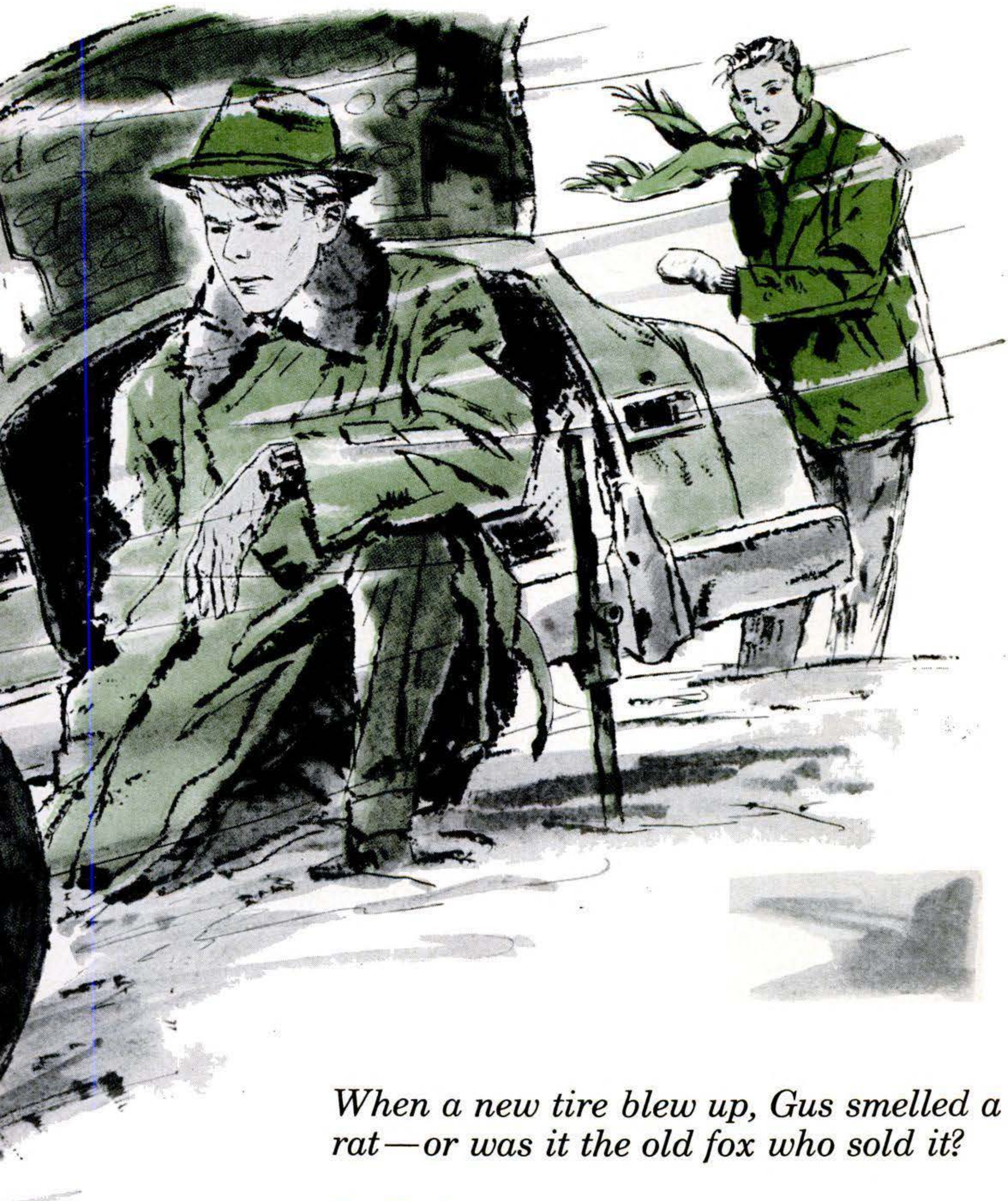

When a new tire blew up, Gus smelled a rat—or was it the old fox who sold it?

By Martin Bunn

GUS was surprised when Harold Strom phoned from up-county to say that one of his tires had blown out. For only a few weeks before, Gus's helper, Stan Hicks, had reported indignantly that Strom had bought a full new set somewhere else.

"Don't fret about it," Gus had said. "Harold probably had to arrange for time payments and didn't want to ask me. He's

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a good kid even if he is a bit high-spirited when he's behind the wheel. I'm glad he has new rubber, wherever he got it."

And now, with almost brand-new tires, Strom was phoning about a blowout.

"It's the right rear," he complained. "It simply blew apart, and I've got no spare. I'm stuck unless you can help, Gus."

"Let's see now," said Gus, thinking fast. He knew Harold was doing odd jobs and saving every cent to get to college. "I've got a fair used tire in your size. I'll bring it myself."

It must have been sheer curiosity, Gus thought as he drove over roads made dangerous by a recent ice storm, that impelled him to do this nuisance chore instead of sending Stan Hicks. But he found reward in the grateful smile that greeted him as he drove up. Harold, a gawky, wide-shouldered kid with a cowlick, had already removed the damaged tire. With him was Bert Vickers, a squirrelly young driver whose own jalopy stood ahead of Harold's.

"Look at this, Gus," said Harold, the grin fading. "Spanking new from Pop Binford's emporium of high prices and low down payments. Half paid for—and all shot."

"That's tough," Gus remarked sympathetically. He squatted down to examine the tubeless carcass. Its bead was broken and a long rip extended into the tread. Repair was impossible.

"I can't see how a new tire could blow like that," said Gus, "unless you ran over something sharp enough to cut it."

HIS eyes followed the car's tracks back through the icy snow. They turned out, as though Harold had been passing another car when the blowout occurred, and a scuffed streak in the right track indicated that the blown tire had been slipping under acceleration. Gus looked sharply at Bert Vickers.

"Were you and Harold racing?"

"No!" It was Harold who answered. "Bert tried to crowd me over. I stepped on it to clear him. That's nothing to blow a tire, is it?"

"No, it isn't," Gus said soberly, taking a used tire off his truck. "This one will do as a spare, Harold, but don't use it for regular service."

Harold answered angrily, "I'll use it just long enough to drive to Binford's service station and make him come across with a new one."

"Fat chance," Vickers hooted from his souped-up jalopy, and took off in a roar of dual exhausts.

As Gus mounted and inflated the used tire, he was inclined to agree with Vickers about getting a replacement out of Pop Binford. Pop was a wily dealer who preyed upon those always hard up for cash, particularly high-school and college students. He charged outrageous prices for his often inferior merchandise, and got away with it by selling on very low down payments and weekly installments. If not exactly crooked, Pop was at least razor-sharp.

While Harold let the car down, Gus picked up the blown tire to put it into the trunk. Suddenly he paused, nostrils twitching. After a brief hesitation, he slammed the lid, then stood watching Harold drive away.

BACK at the Model Garage, that afternoon, Gus was installing a rebuilt engine when Harold pulled in.

"Of all the lousy deals," he declared angrily. "Binford wouldn't replace that tire, Gus."

Gus turned from his work, dug out and lit his pipe. "Tell me about it."

"Binford said he'd ordinarily replace such a tire, but that in this case it had been abused, that my driving was—"

"Squirrelly," Gus interrupted.

"But it isn't," Harold protested.

"No," Gus agreed, "but you couldn't quite resist that challenge from Vickers, who *is* squirrelly. Nevertheless, that tire shouldn't have blown, and Binford knows it. I'd like to turn the tables on the old fox just this once. Let's take another look, or rather smell, at that tire."

"Smell?" Harold asked, surprised.

Gus didn't answer, but lifted the tire out of Harold's car and sniffed at it.

"Hah!" he grunted, and strolled back into the office. Shuffling through papers on his battered desk, he selected one, turned to the telephone, and dialed.

"Binford?" he said. "Gus Wilson. How's business? . . . Same here. This cold wave has us hopping."

"Bawl him out, Gus," Harold hissed.

"Say," Gus asked, "have you had trouble with air hoses gathering moisture

[Continued on page 238]

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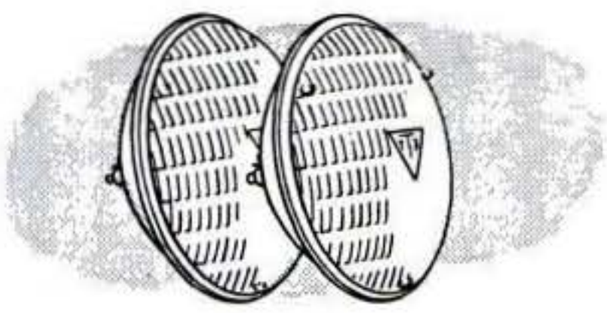
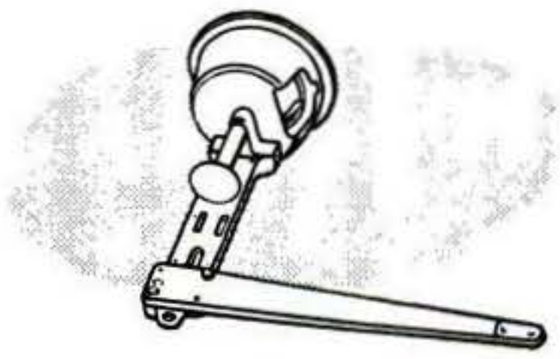
The best reasons a man could possibly have for "aimed light" when he drives at night!

If your headlights are two years old . . . install new Guide T-3s for MORE LIGHT—AIMED RIGHT!



GUIDE T-3

FIRST headlamp designed with three "Guide Points" for quick and easy aiming by precision mechanical method.



SAFETY AIMER

EASY adjustment without even having to turn headlamps on . . . assures perfect alignment and placement of light on the road.

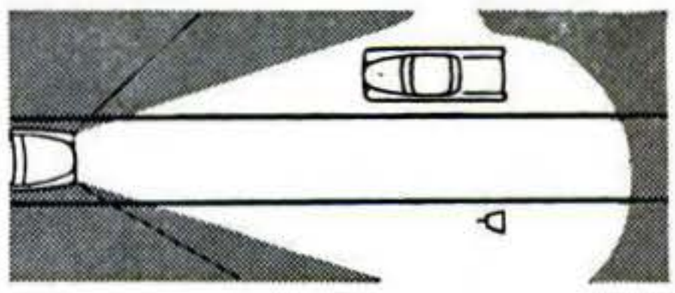
PERFECT AIM IN MINUTES

ATTACH AIMER . . . a quick screwdriver adjustment and the job is done—in minutes—even in broad daylight.

Guide **T-3**

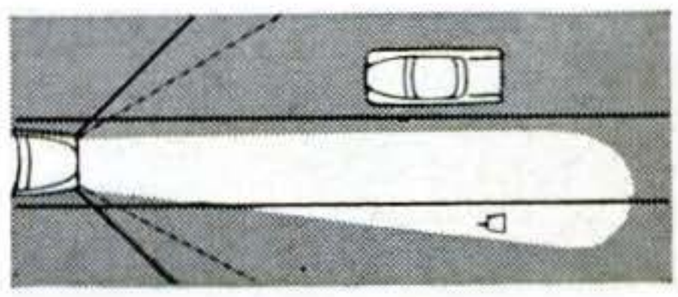
SAFETY-AIM HEADLAMPS

BUY IN PAIRS WHERE YOU SEE **AC**



POOR AIM

HEADLAMPS out of adjustment . . . reduce visibility, can blind approaching drivers.



PROPER AIM

GUIDE T-3 headlamps can be aimed in minutes for better visibility and safety when you drive at night.

AC THE ELECTRONICS DIVISION OF GENERAL MOTORS

Watch Walt Disney Studios ZORRO weekly on ABC-TV

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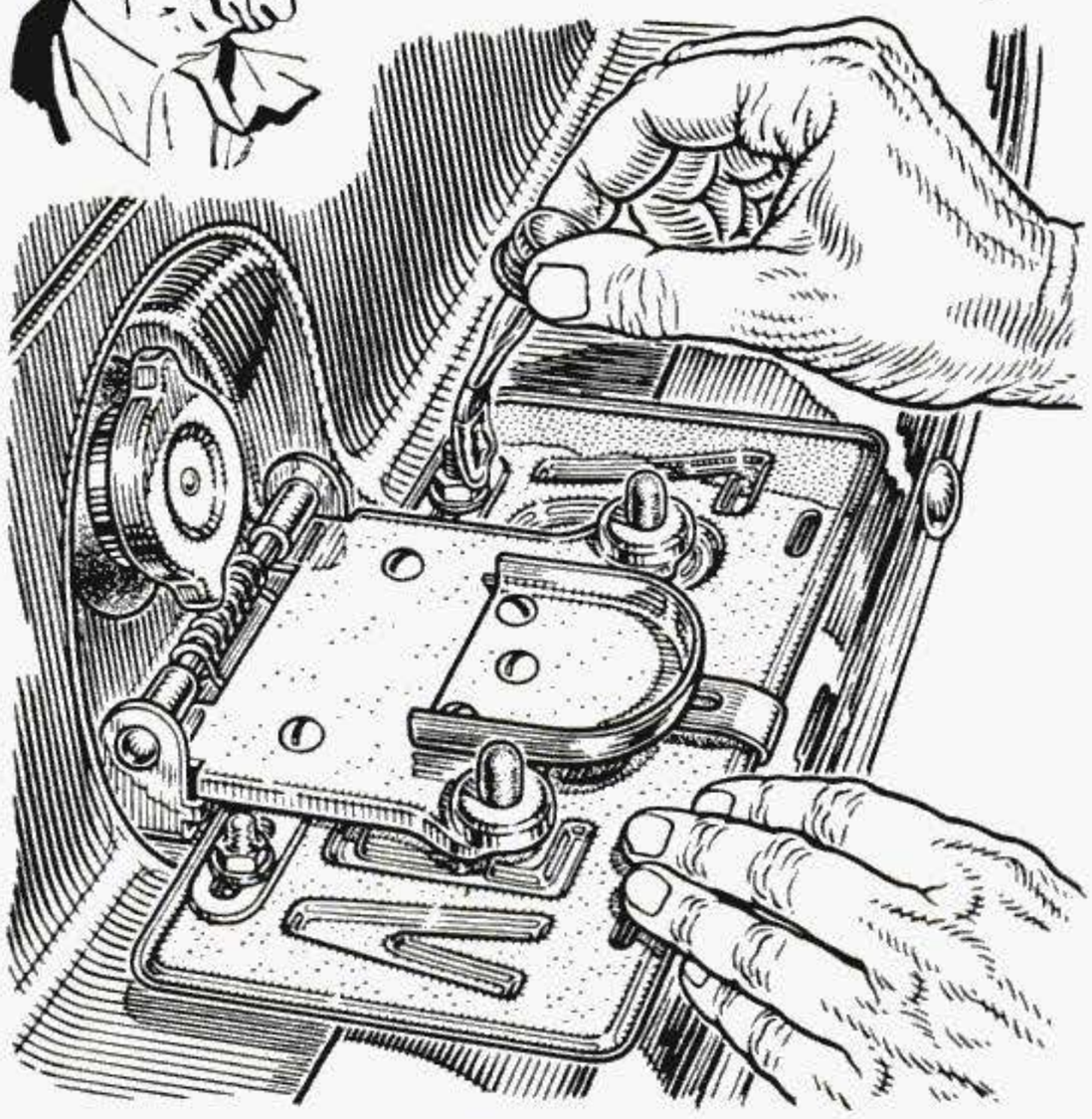
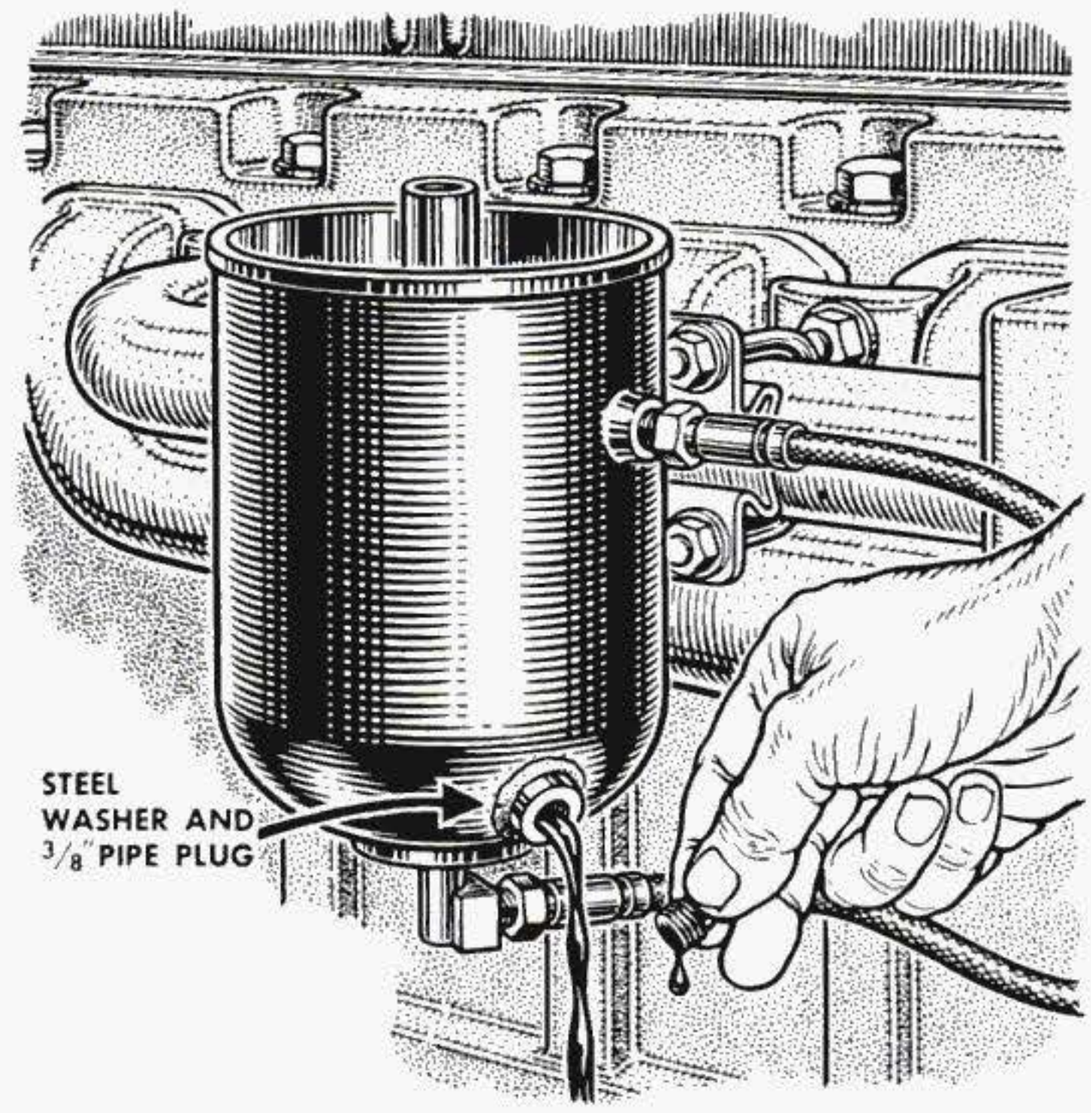
Hints from the Model Garage

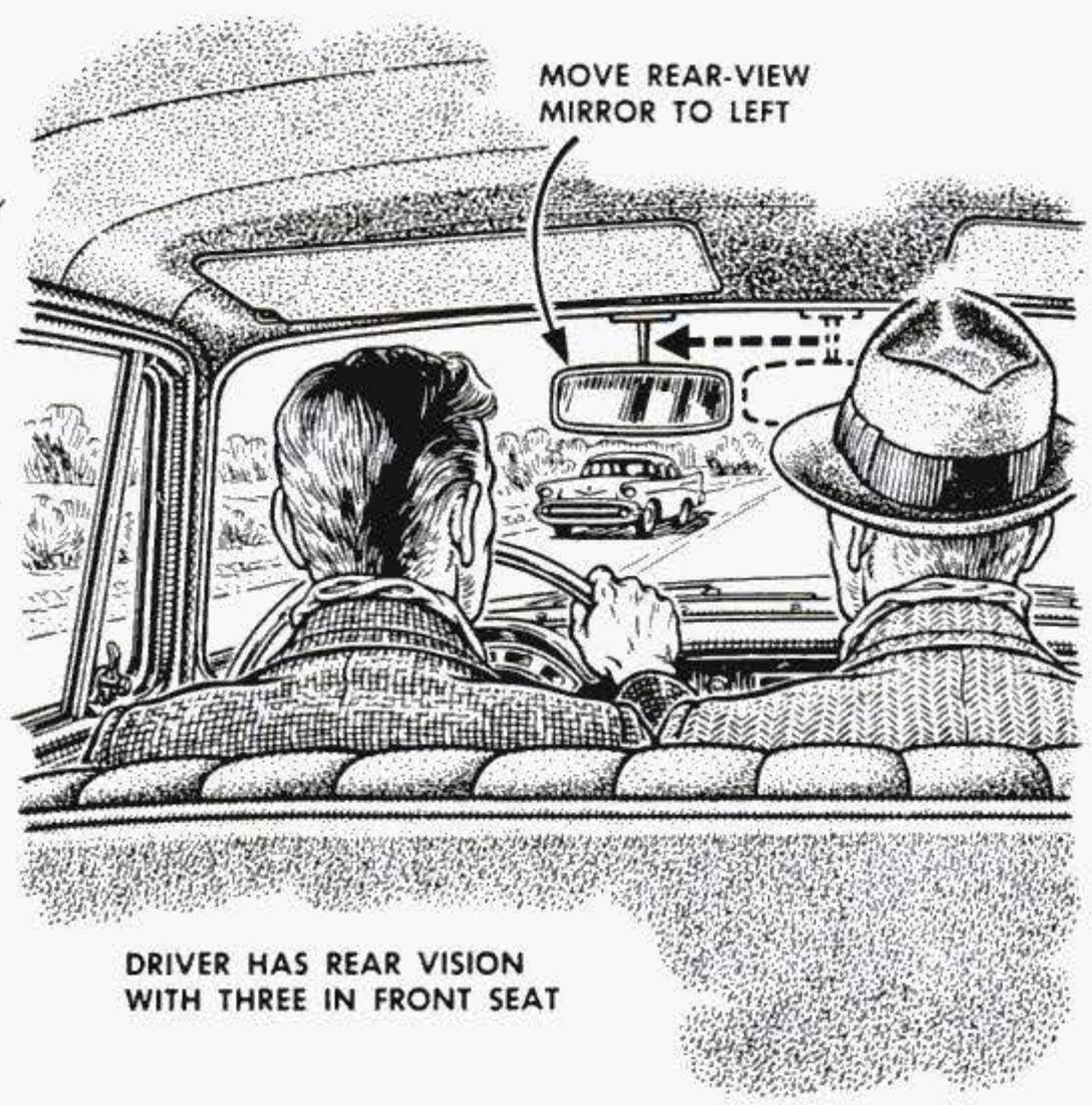


Putting on new license plates? Coat the nuts and the protruding ends of the fastening bolts with gasket shellac. This will keep them from loosening under vibration, and prevent the nuts from rusting and seizing on the bolt threads.

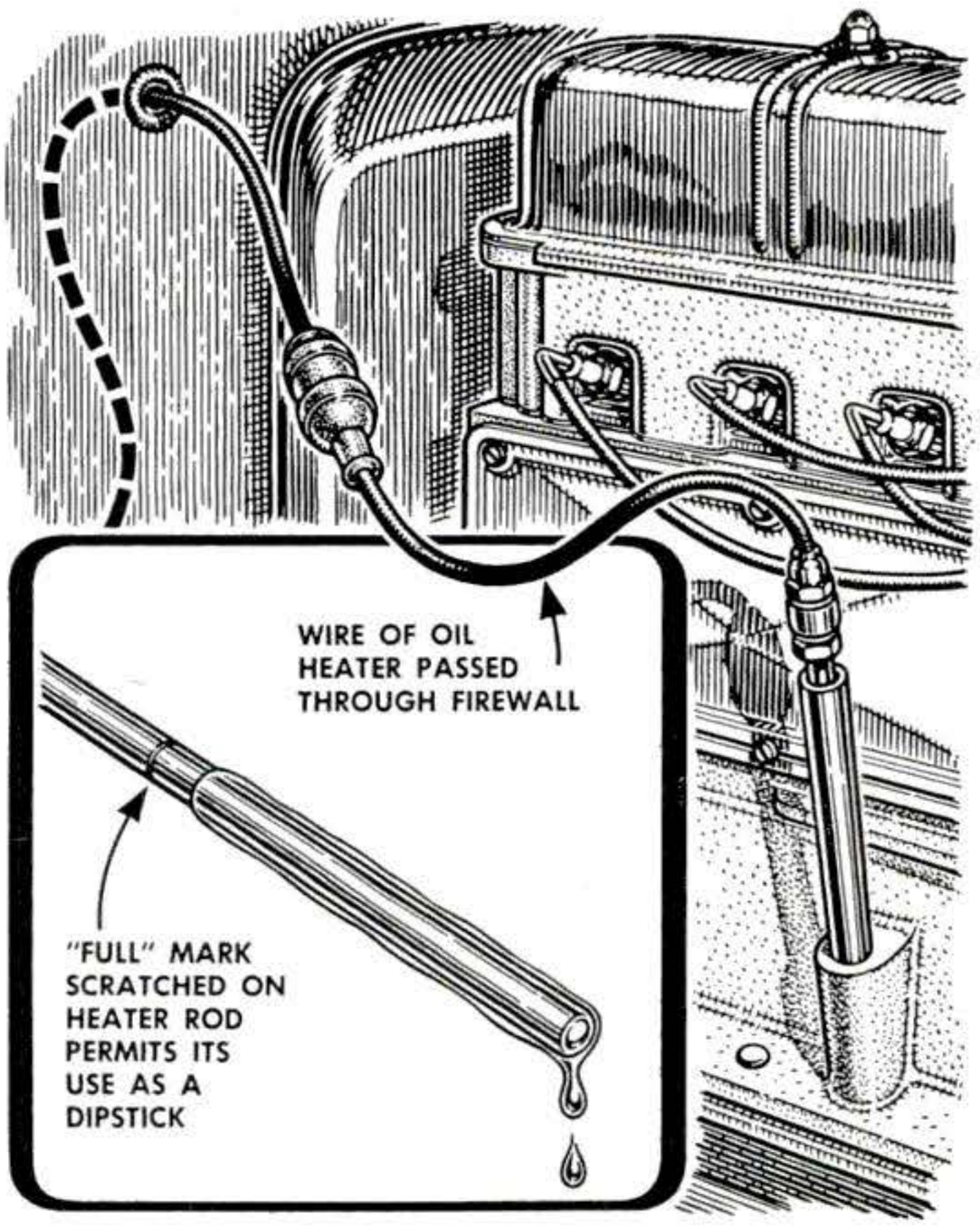


Install a drain plug at the bottom of a permanent oil-filter housing, and you won't need a suction gun to empty the case when changing filters. Braze a thick steel washer to the outside of the case, drill it, and thread for a pipe plug.

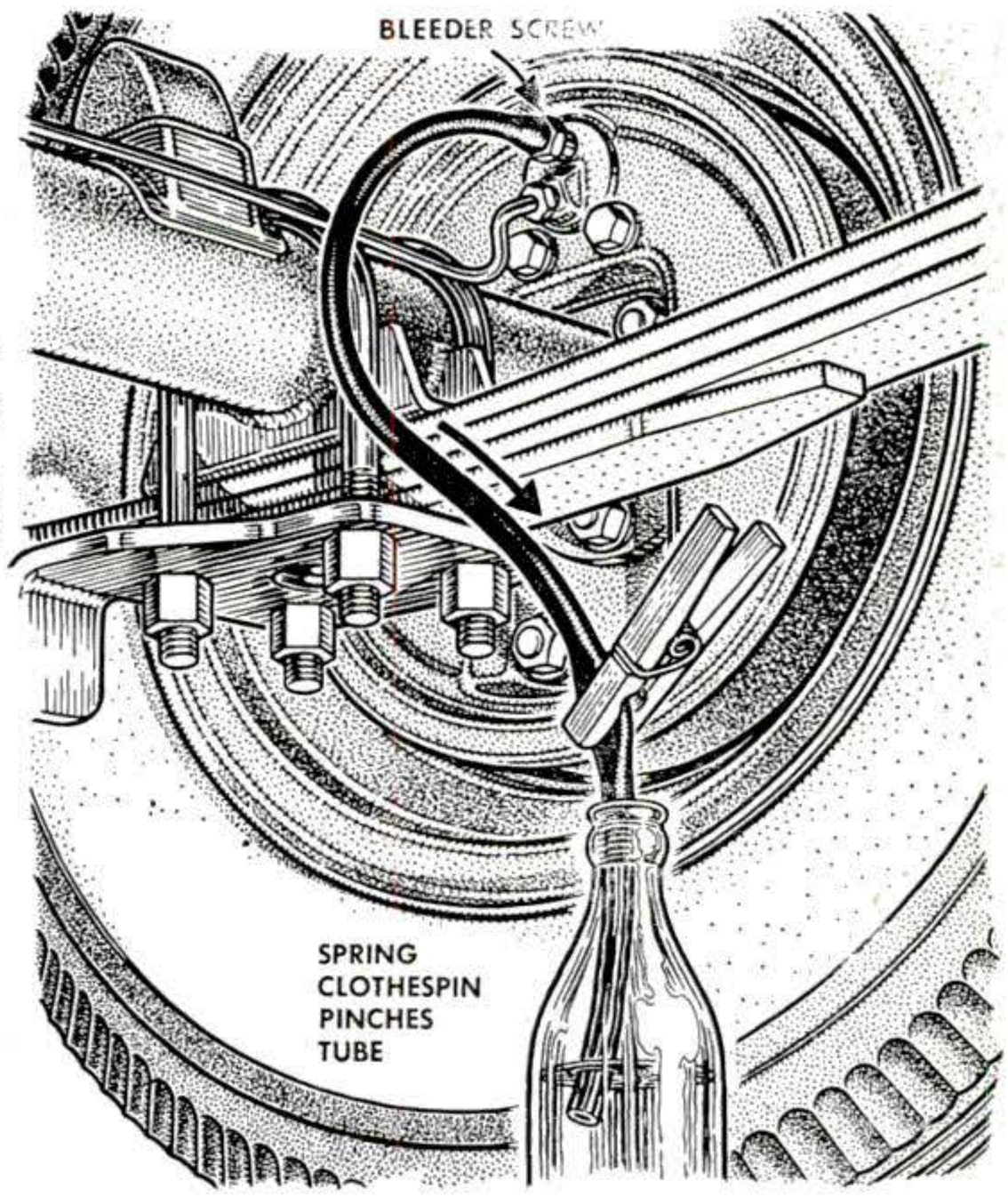
A loose plastic knob on a window crank can be tightened and restored to service simply by filling the worn centerhole with wood putty and pressing it back on the metal stem. Let the wood putty harden a few days before using the crank.



Three in front your usual driving arrangement? You'll find it worth while to move the rear-view mirror to the left so the middle passenger doesn't block your view of the road behind. A second mirror to the left of the original is even better.

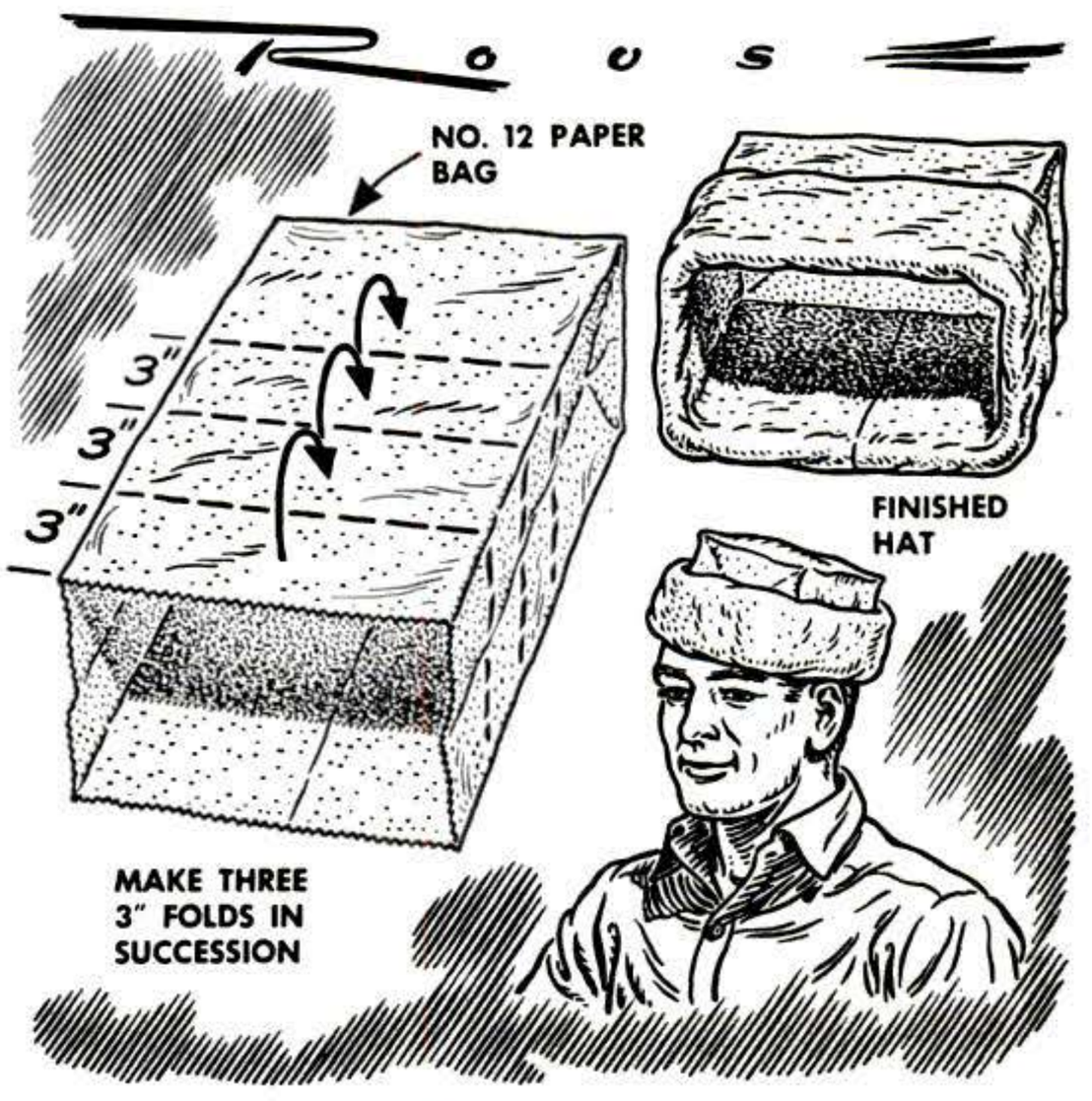


Scratch oil-level marks on your dipstick heater and use it in place of the regular dipstick through the winter. Run the wire into the car where it can easily be passed out a window and plugged into an outlet whenever the car stands idle.



When bleeding brakes with no one to help, a spring clothespin on the bleeder hose serves as a one-way valve to prevent the hose from drawing in air bubbles when the brake pedal is released. Check the master cylinder after bleeding each wheel.

Aim a flashlight where you need it by propping it between the open jaws of pliers stuck in the ground. If the ground is paved or too hard-packed, secure the jaws of the pliers to the light with tape so the handles serve as legs.



A paper hat, folded from a No. 12 paper bag, provides double protection when you work under a car. It keeps grease and dirt out of your hair, and the folded sides cushion bumps and soften contact with the ground when you rest your head.

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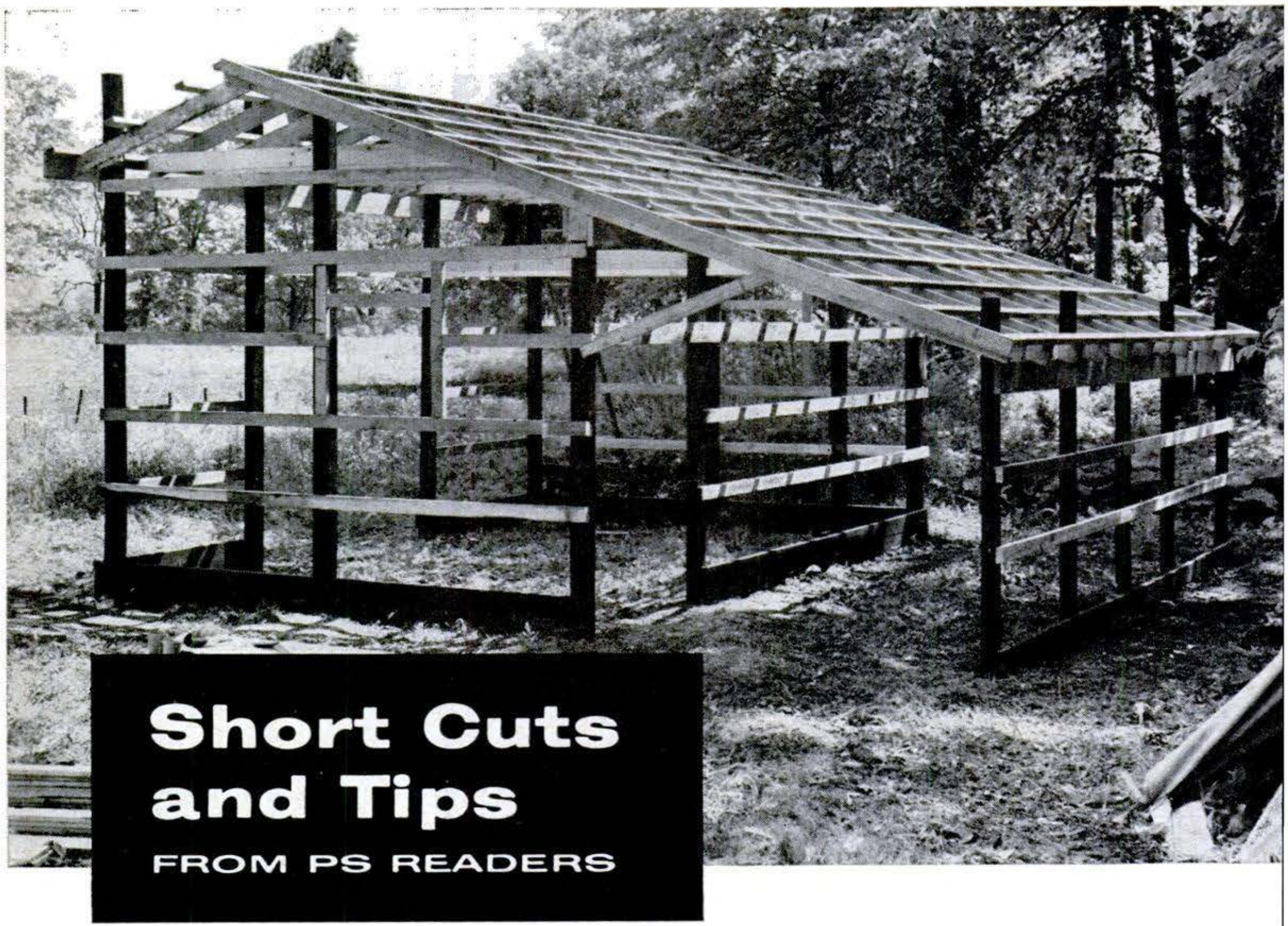
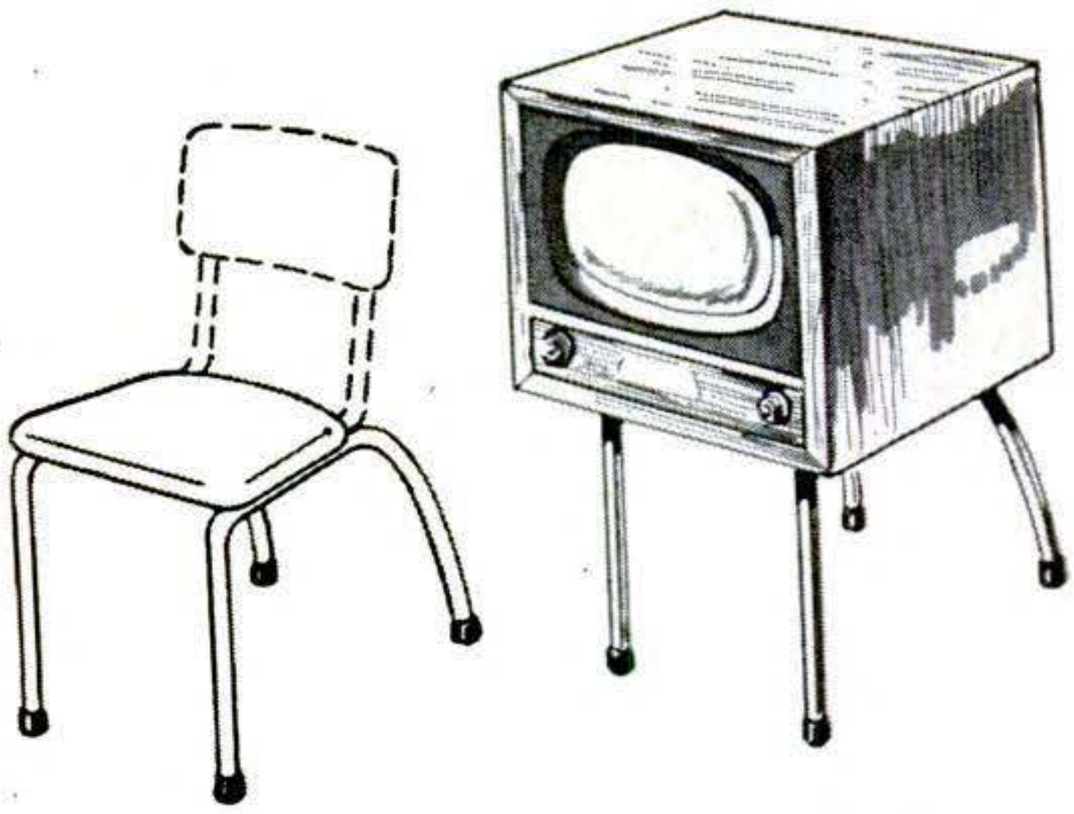
How You Could Build a Garage



Short Cuts and Tips

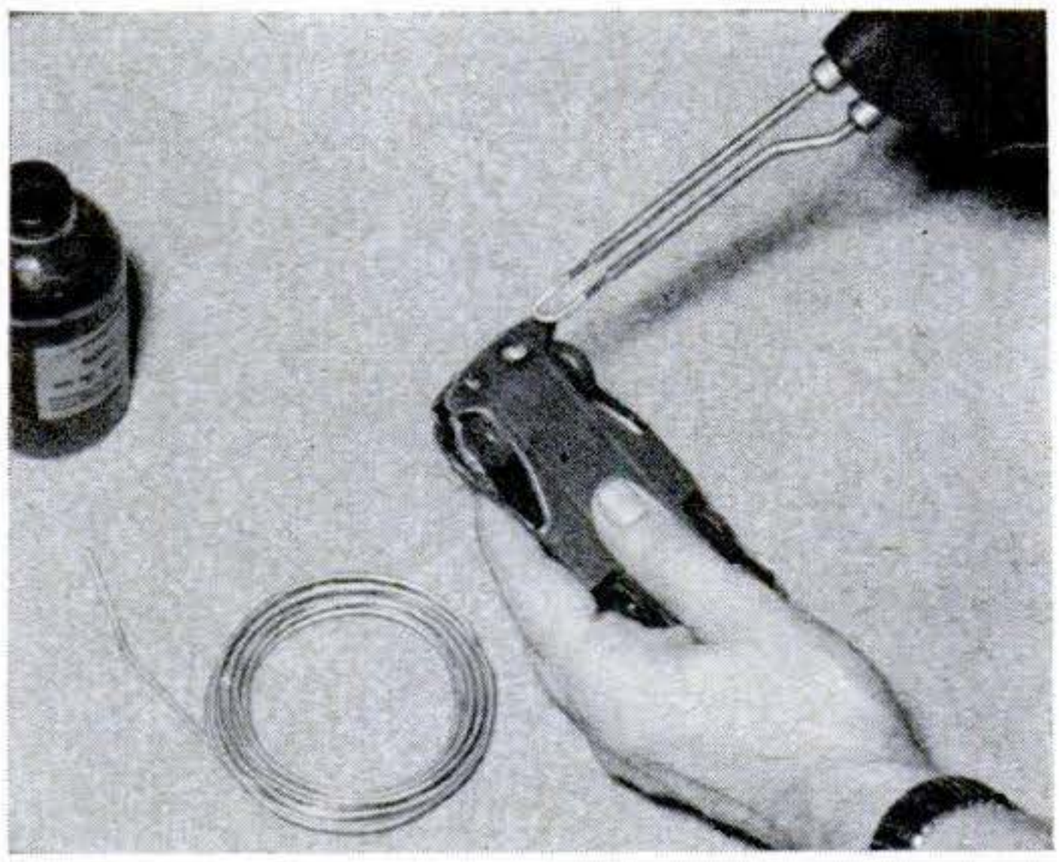
FROM PS READERS



Backless Chair Makes TV Base

IF YOU'RE replacing a tubular dinette set, salvage one of the chairs. Remove the back and its supports and you have a sturdy base for a TV set.

The seat is attached to the leg assembly at a slight angle and this tilts the screen of the set just right for comfortable viewing.—*Norm Jacky, Seattle, Wash.*



Soldering Strengthens Toys

INEXPENSIVE toys made of sheet metal will last much longer if you solder down the metal tabs that hold them together. These tabs are usually on the underside where they don't show. Heat from the iron will burn off the paint and then a touch of flux will clean the area for soldering—*M. C. Anderson, Arlington, Va.*

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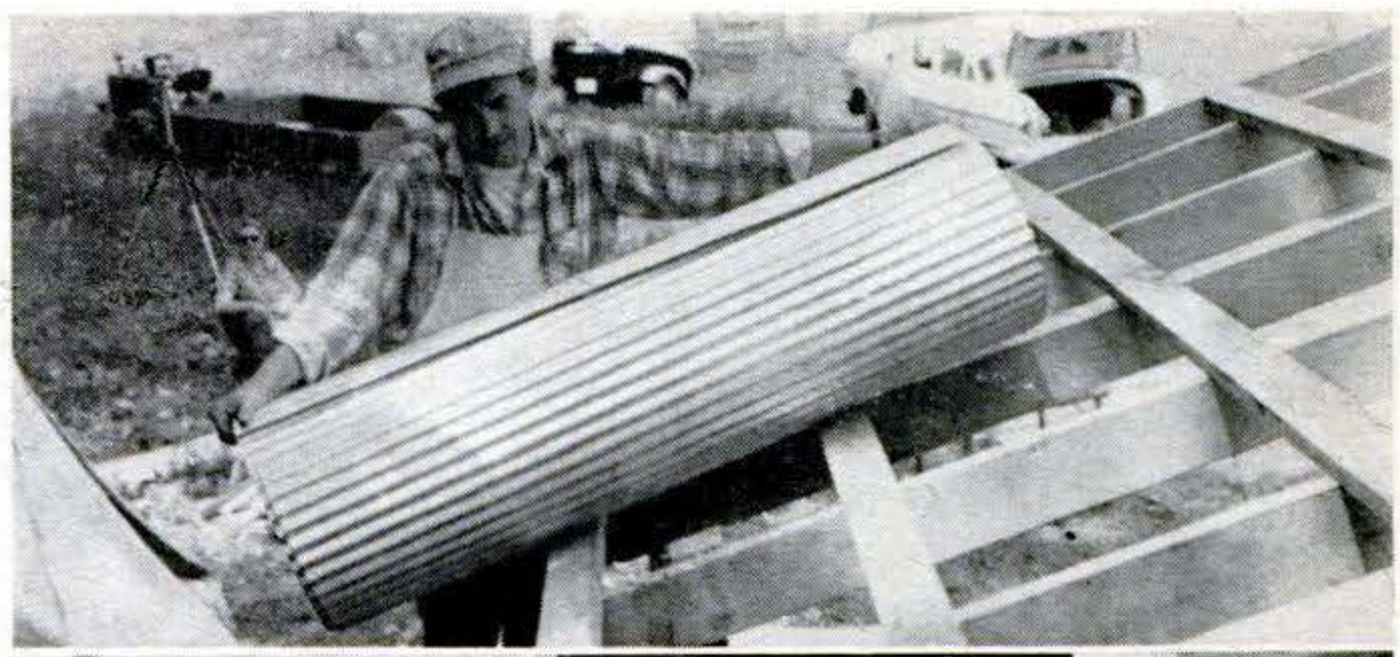
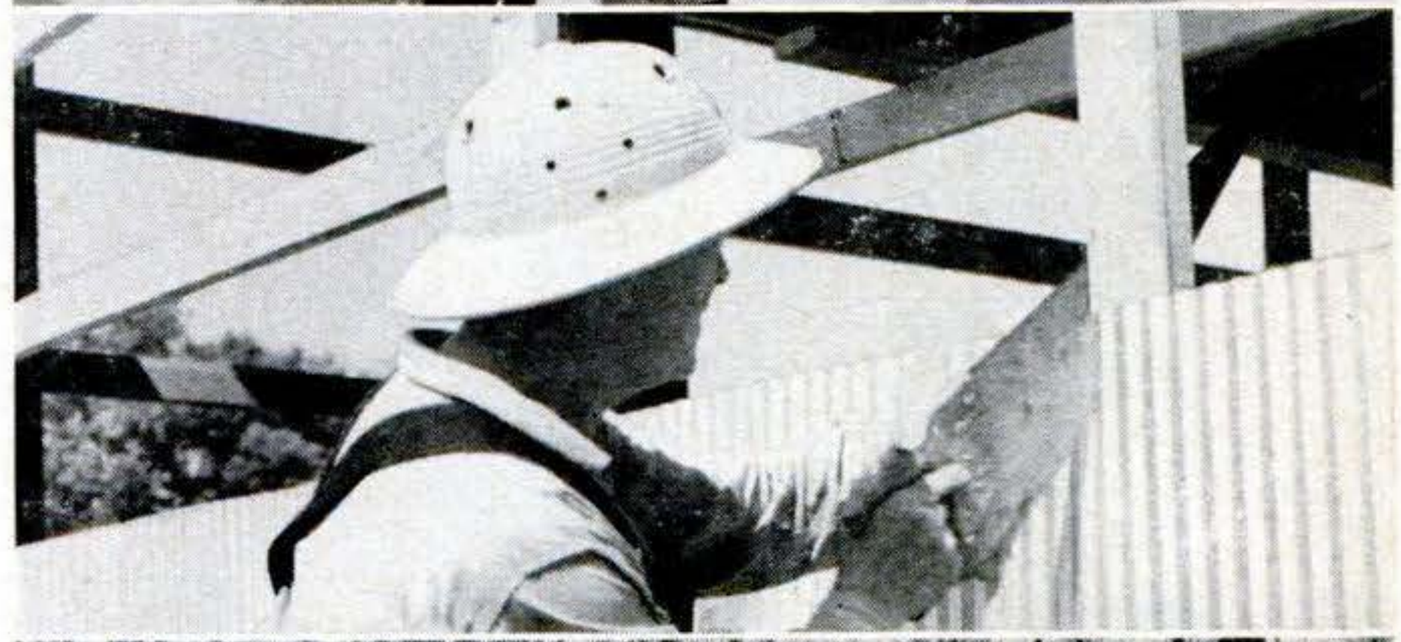
the Easy Way

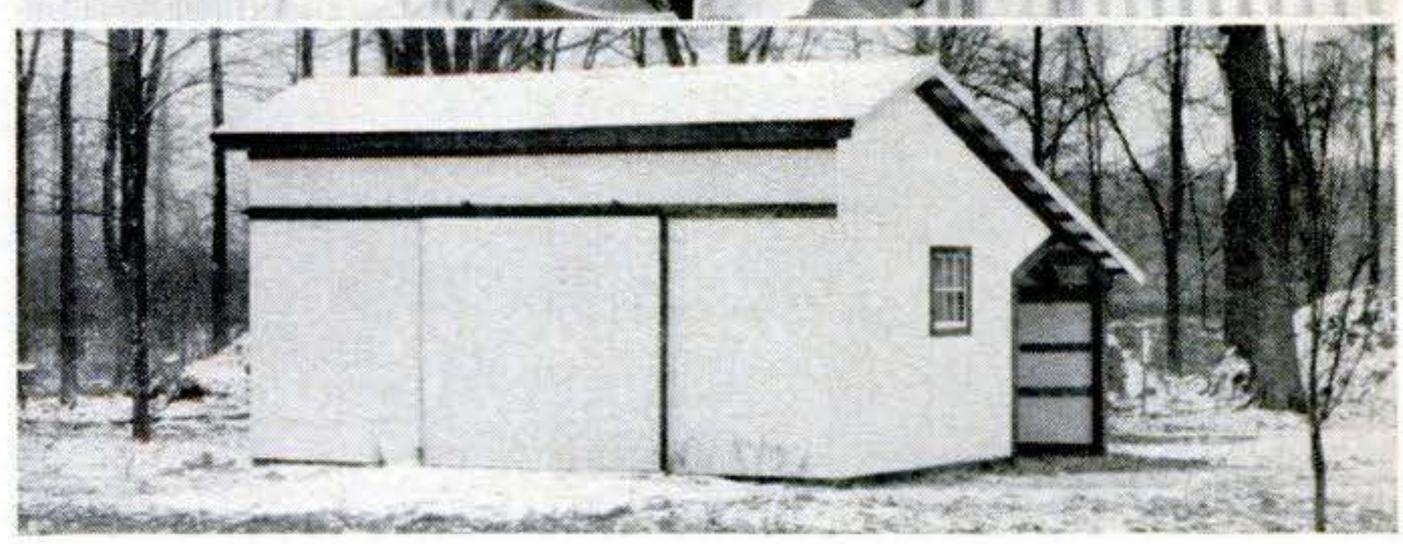
ANY homeowner in need of a garage could adapt the procedures used in building a combination tractor garage and utility shed on the property of V. A. McChesney in Ypsilanti, Mich.

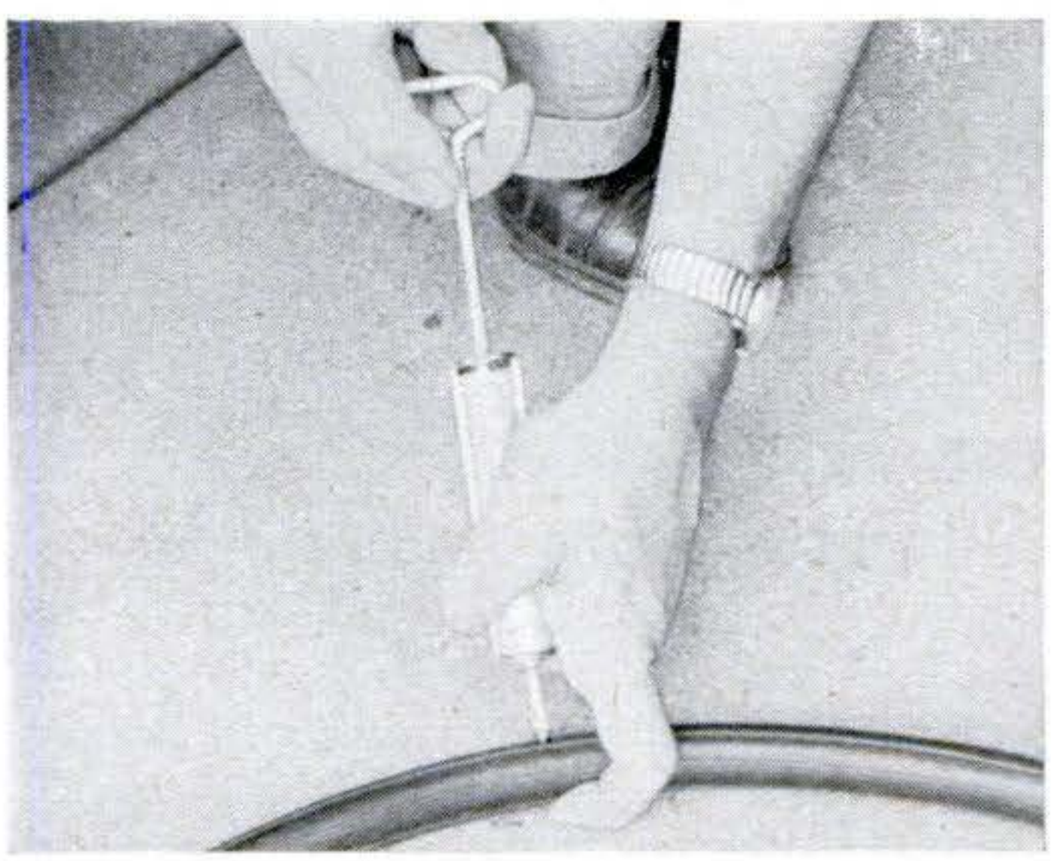
The usual foundation and concrete slab were dispensed with. Instead, posts treated with a preservative were set into the ground and the framing pieces were nailed to them—a procedure now widely used in putting up barns and other farm structures.

The framework was then covered with Kaiser corrugated sheet aluminum. This metal covering was used both as roofing and siding. It comes in rolls for easy handling, can be cut with an ordinary handsaw, and needs no finishing. A matching ridge roll is available to seal a roof.



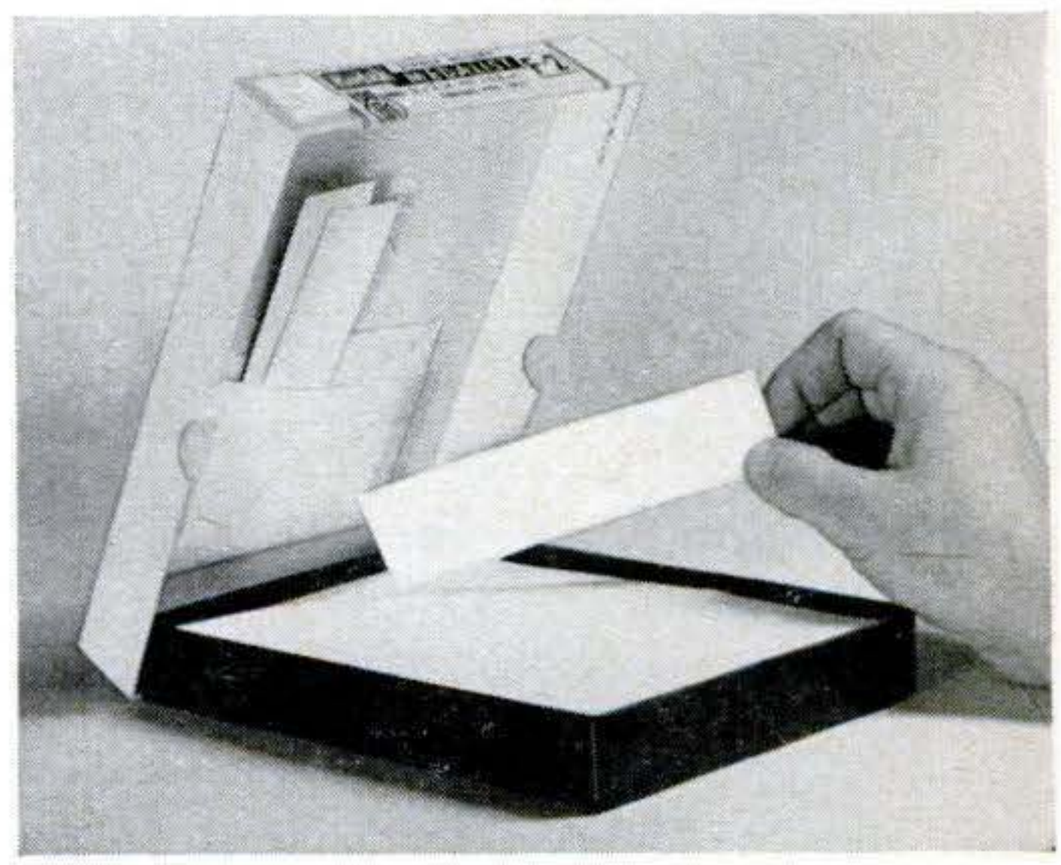






Tire Tool Repairs Garden Hose

THOSE little gun-type kits designed to repair tubeless tires can handle other mending chores, too. I use one to take care of punctures and small breaks in my rubber garden hose and it works fine. When the injected plug of soft rubber hardens, it forms a permanent repair.—*Martin C. Andrews, York, Pa.*



Test-Strip File Aids Photog

TEST strips are sometimes hard to get at—especially after sheets of enlarging paper have been unwrapped and stacked on them. A pocket on the lid of the box will keep the strips handy. I cut off one end of a sealed envelope and taped it to the box, cut-side up, to make a 3″-deep pocket.—*N. D. Carlson, Willoughby, Ohio*

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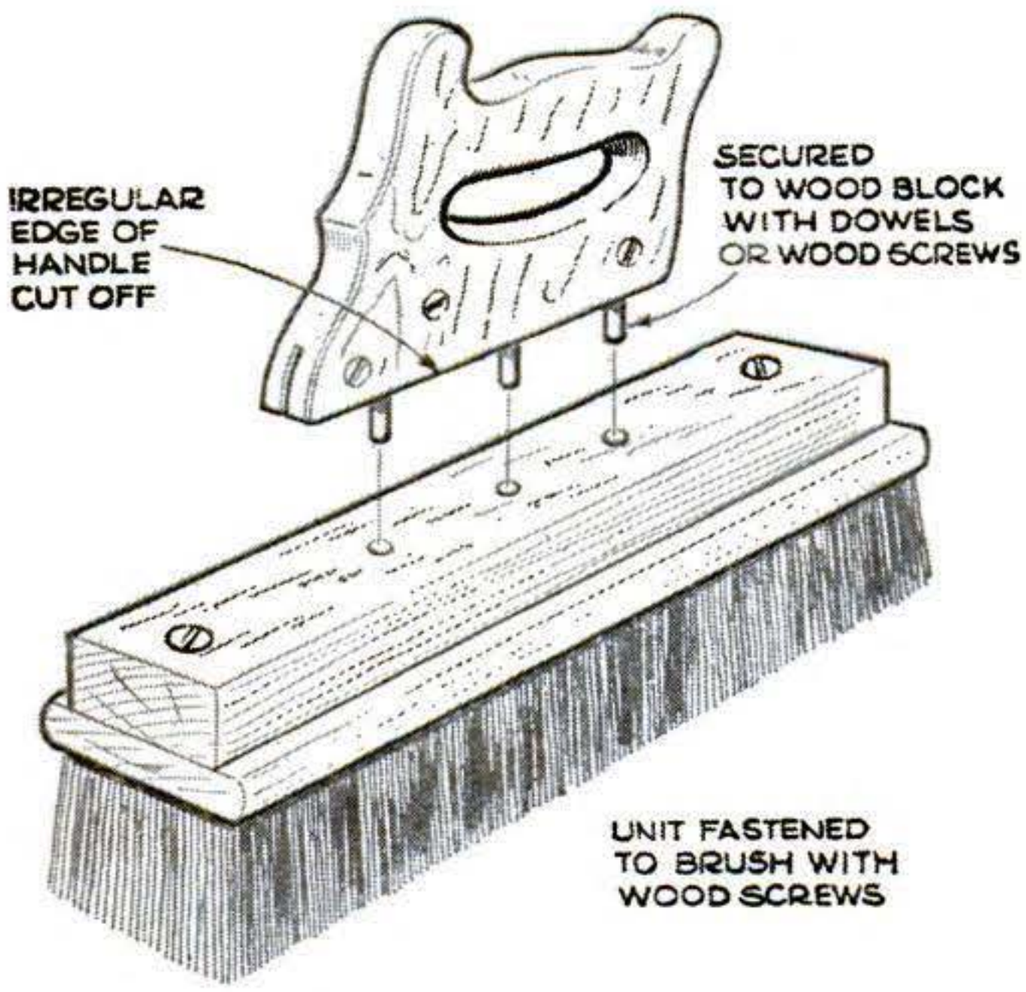
Short Cuts and Tips

Slippery Shovel Eases Work

LIFTING a shovel full of heavy snow is tough enough without having to shake it off at arm's length, too. I cut down on arm- and back-aches by rubbing household paste wax on the shovel blade. Now a sticky load of snow slides off effortlessly.—*John Comstock, Wellsboro, Pa.*

▶▶▶WORN spots in flexible-plastic dishpans, scrub pails and baby bathtubs can be reinforced with ordinary tire-tube patches. Rough up the area with a file, apply rubber cement to it and press on the patch.—*Madeline Scott, Minneapolis.*



Saw Handle Aids Scrubbing

WITH a handle taken from an old saw fastened to the scrub brush, you can clean walls and floors faster and easier. The handle is doweled or screwed to a wood block and the block is then screwed to the brush. When one brush wears out, I just switch the handle unit to another.—*Victor Lamoy, Upper Jay, N. Y.*

▶▶▶WHEN a leak in a canteen or other container is too small to see, here's an easy way to find it. Drop in a teaspoon of baking soda, fill the container with water and shake well. Bubbles will form over the hole.—*Henry Mayo, Sarasota, Fla.*

Foil Plates Hold Small Parts

I SAVE those metal foil plates that TV dinners come in, for storage trays. Small parts and odd bits of hardware fit neatly into the sections.

By making a simple rack I can keep eight trays together in a small space. Back and bottom are 1/4" plywood; they hold the 3/4"-thick sides together. I spaced the sides just far enough apart so that they hold the rims of the trays snugly in 1/4"-by-1/4" grooves. The vertical distance between grooves is 1 5/8". Seven trays slide into groves while the eighth foil tray rests on the top of the rack.—*Louis Hochman, Sherman Oaks, Calif.*

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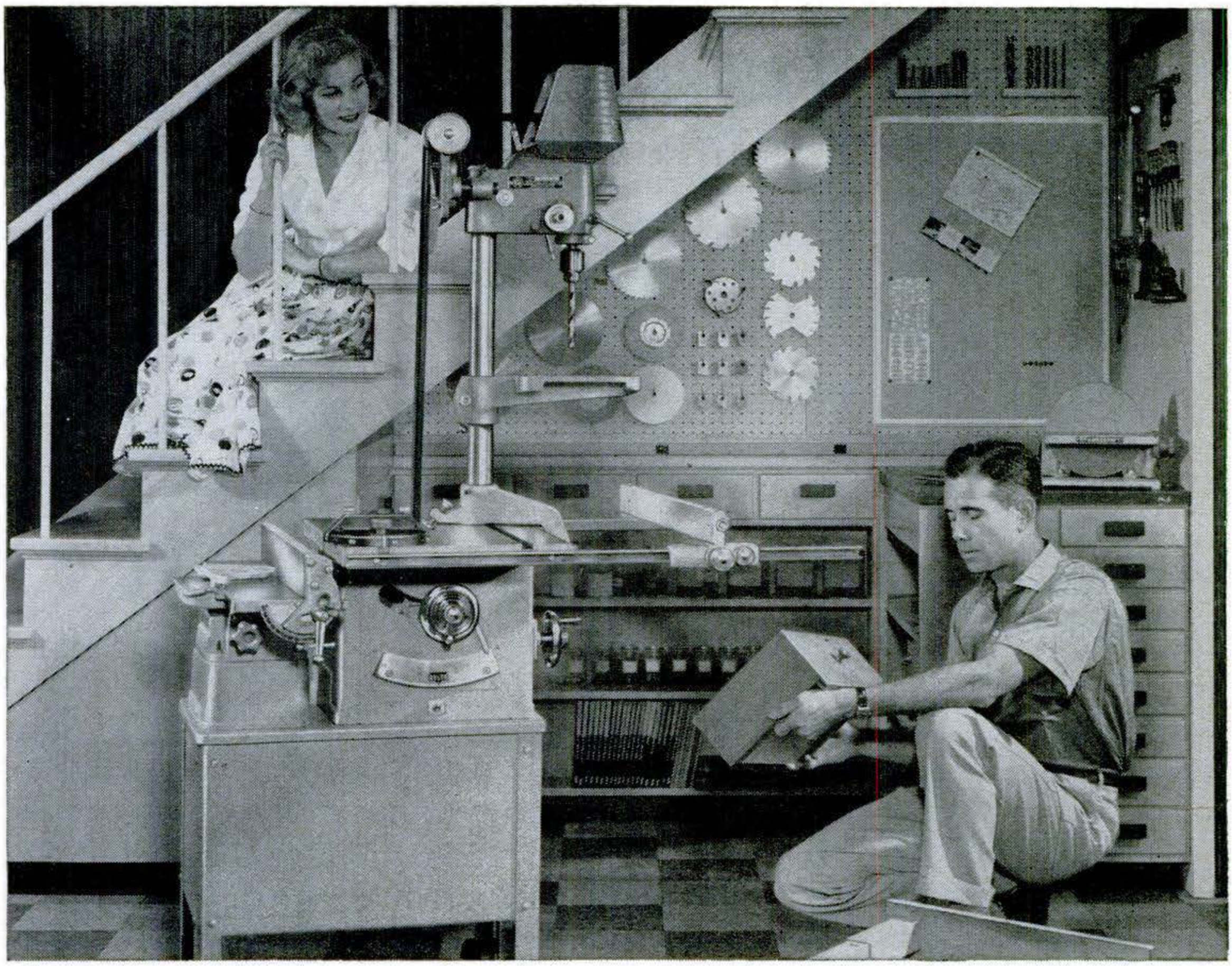

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Short Cuts and Tips

Tape Recorder Gives Ham Beginner Slow Code Practice

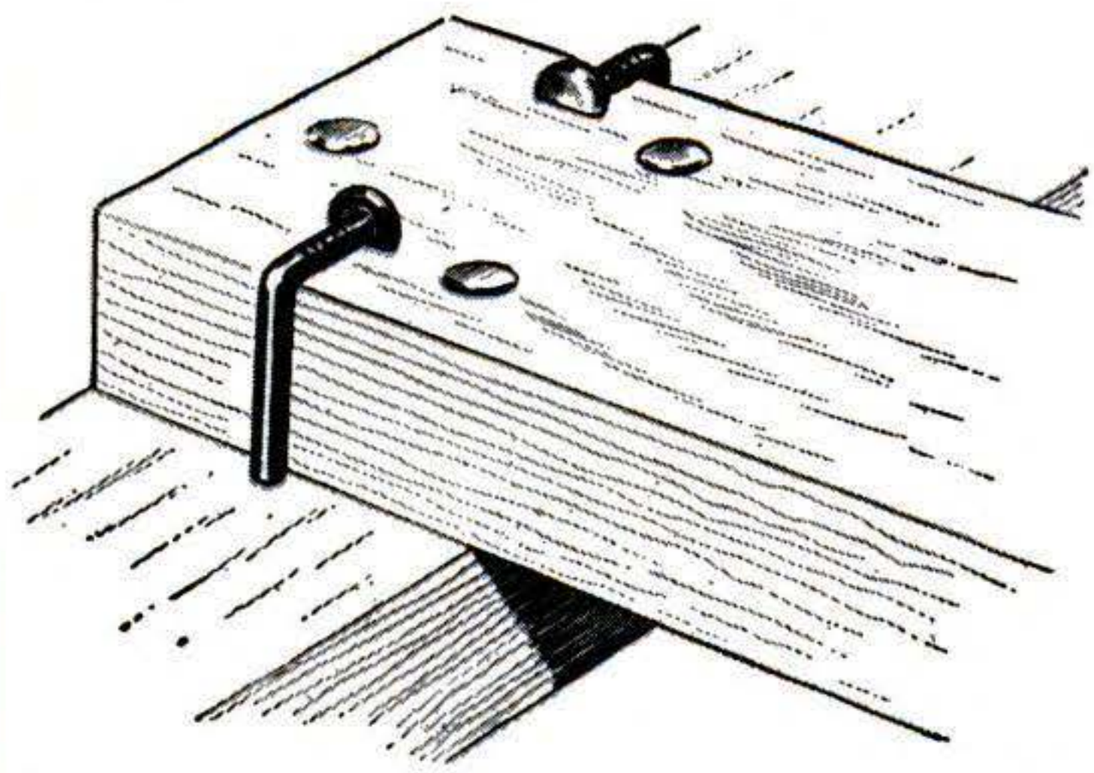
SHORT-WAVE and other code messages from ships and stations may come in too fast for a radio ham just beginning the hobby. But if he owns a two-speed tape recorder he's all set. Messages recorded at fast tape speed can be played back at slow speed for the code practice he needs. —*Alfred Mardt, Philadelphia.*

▶▶▶WHEN rewiring the horn of my car, I found that a wire coat hanger is a good tool for running electric wire through a long enclosure. Opening the hanger carefully to preserve the spirals, I unbent it to form a long rod. Then I pushed the horn wire through the enclosure as far as it would go and inserted the coiled tip of the rod in the opposite end. A twist or two of the corkscrew-like spirals gripped the wire so that I could pull it through. —*J. S. Cruickshanks, Oswego, N.Y.*

▶▶▶IF ROOM temperature drops below 40° F., the automatic-control mechanisms on many food freezers don't work and freezer temperature becomes too high for safe storage of food. My freezer is in an unheated garage. To keep its temperature control functioning, I put an electric heating pad, turned to "low," over the control box. A blanket hung over the pad helps it hold the heat. Now the control works and the freezer stays at zero or colder.—*R. C. Blatt, Larchmont, N.Y.*

Radio Knob Makes Car Fix

IF A knob is lost from a window handle of your car, replace it with a small radio tuning knob. Secure the knob to the existing pin with a setscrew. If the pin is lost, too, you can substitute a flathead screw. —*L. J. Clayson, Los Angeles.*



Bent Nail Saves Splitting Lath

WHEN making a trellis, I avoided splitting the lath ends by first driving in a nail at each end and bending it over. The heads added holding power and I could then sink any number of nails without trouble.—*Roger M. Snook, Daly City, Calif.*

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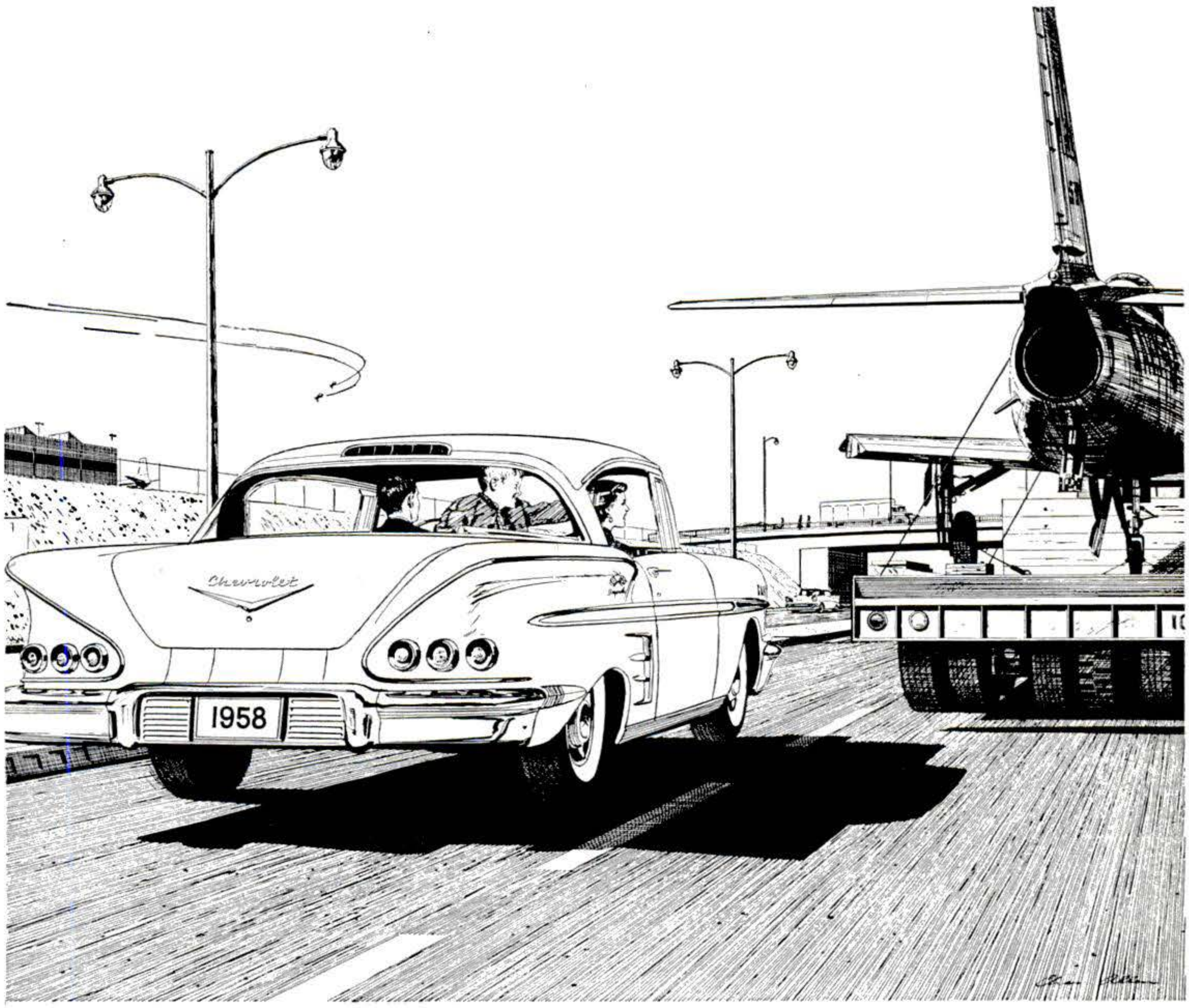

Smoothest sprint on four wheels!

TURBOGLIDE + TURBO-THRUST!

Like peaches and cream, some things seem just made to go together. On the road, the combination that really fits like a glove is Chevy's Turboglide* transmission and the radical new Turbo-Thrust V8*.

Look at the specs and you'll see why. Turbo-Thrust has a whopping 348 cubic inches of displacement—and that means oceans of torque, particularly at low- and mid-range speeds. Tie this to Turboglide's triple-turbine torque converter and you'll think you've got the municipal power plant under the hood!

Turboglide never shifts — there are no "ranges" or gear "steps." And so take-off is just one solid whispering sweep of power; cruising is as hushed and effortless as the serene drift of summer clouds.

The actual elation this superb combination provides is impossible to describe. When you experience it yourself, you'll know one of the great moments of motoring. Why don't you let your Chevrolet dealer set up that great moment for you—this week?... *Chevrolet Division of General Motors, Detroit 2, Michigan.* **Optional at extra cost.*

CHEVROLET

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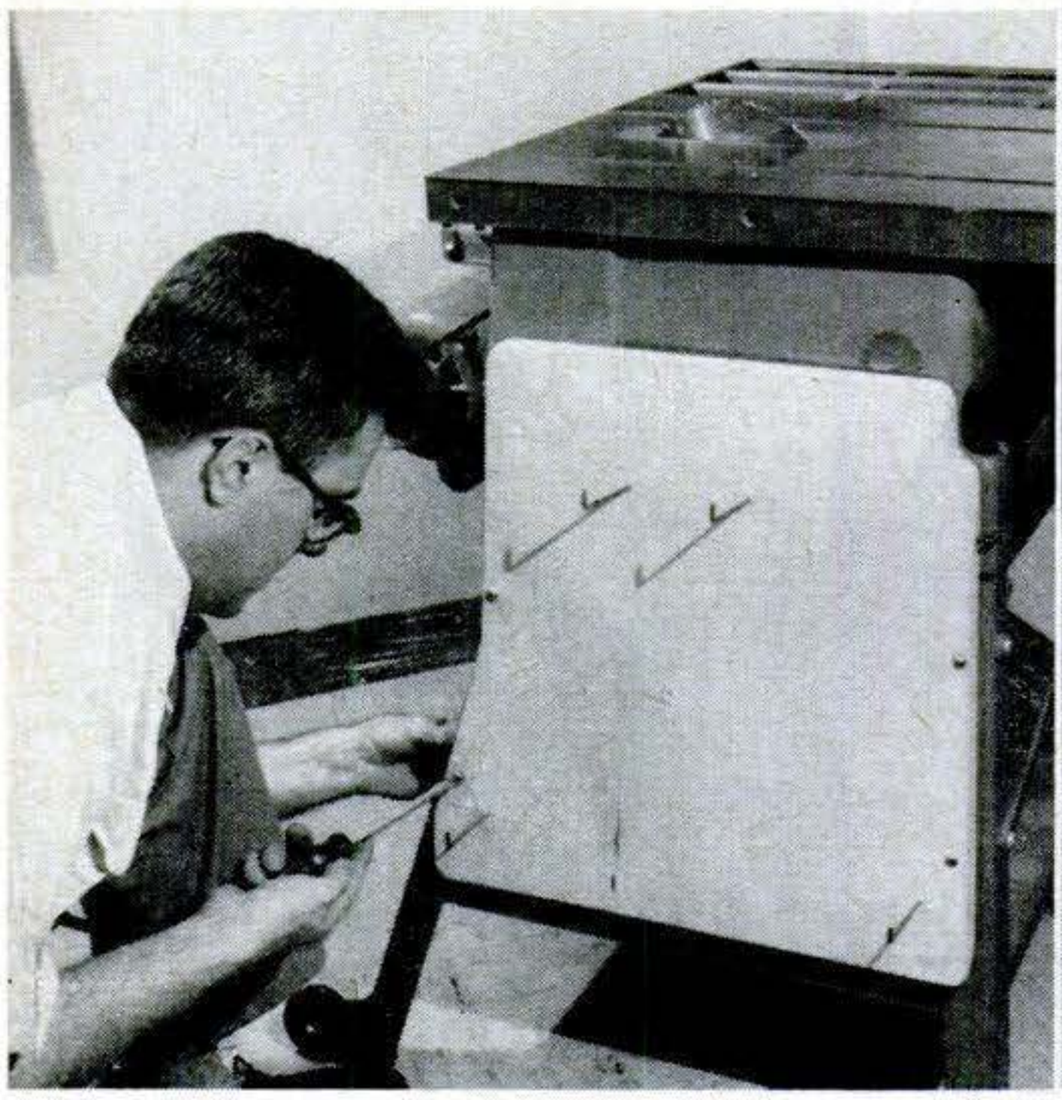
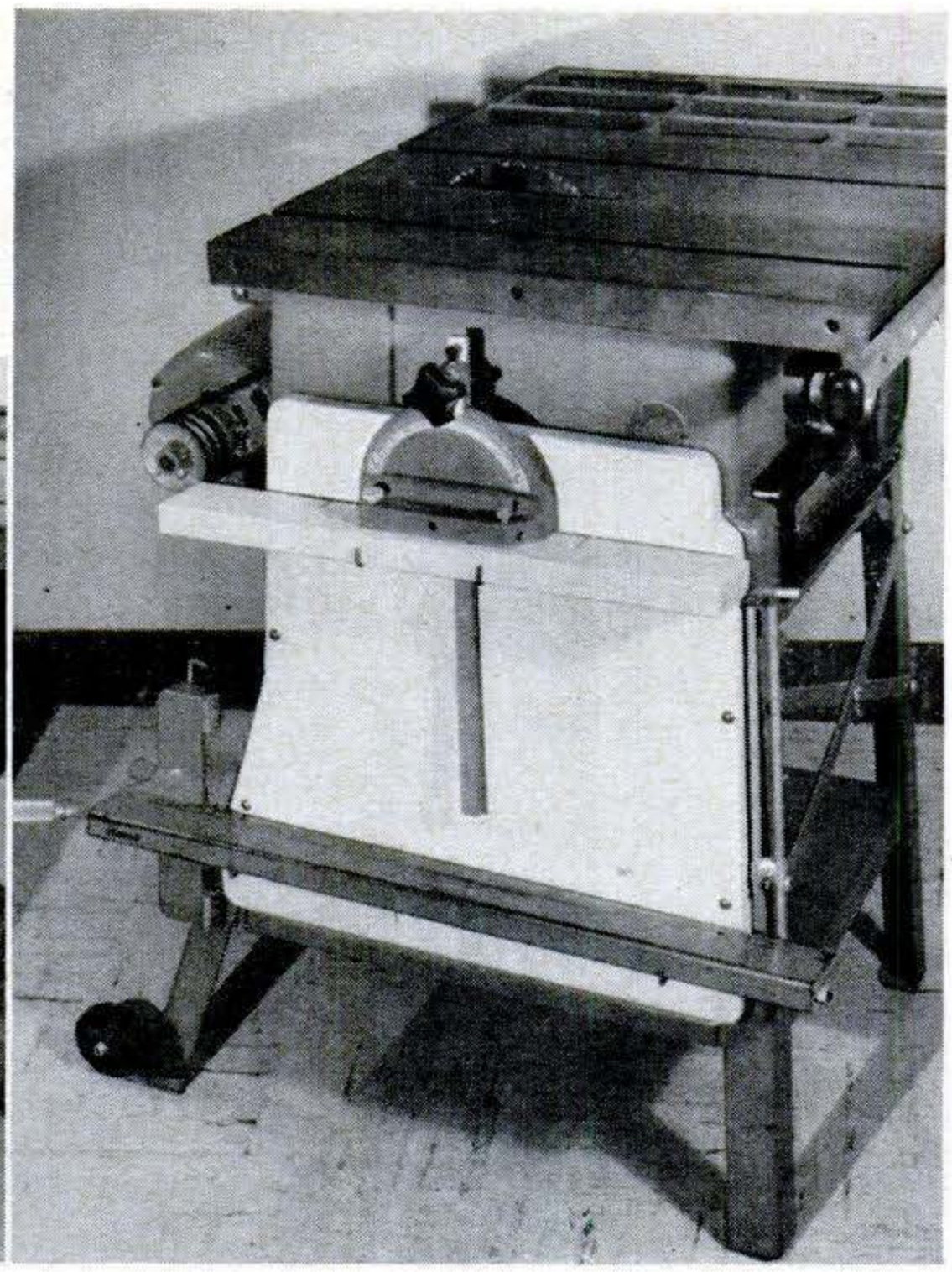
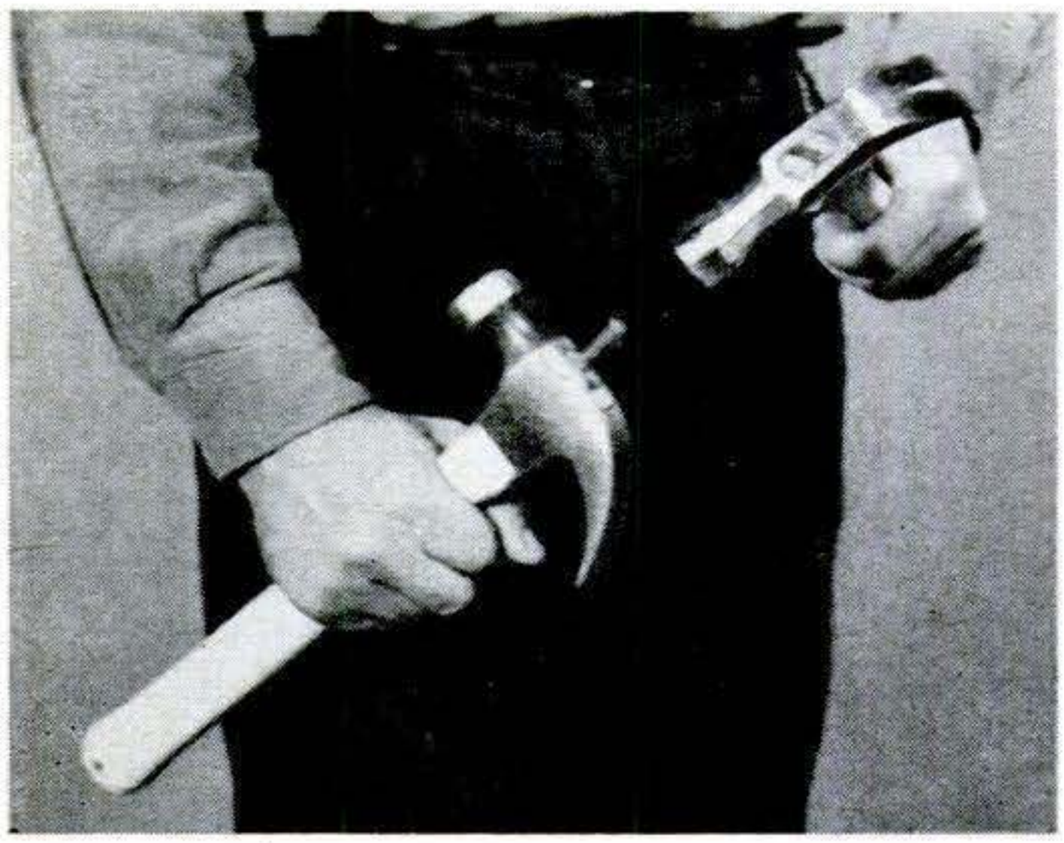
Short Cuts and Tips





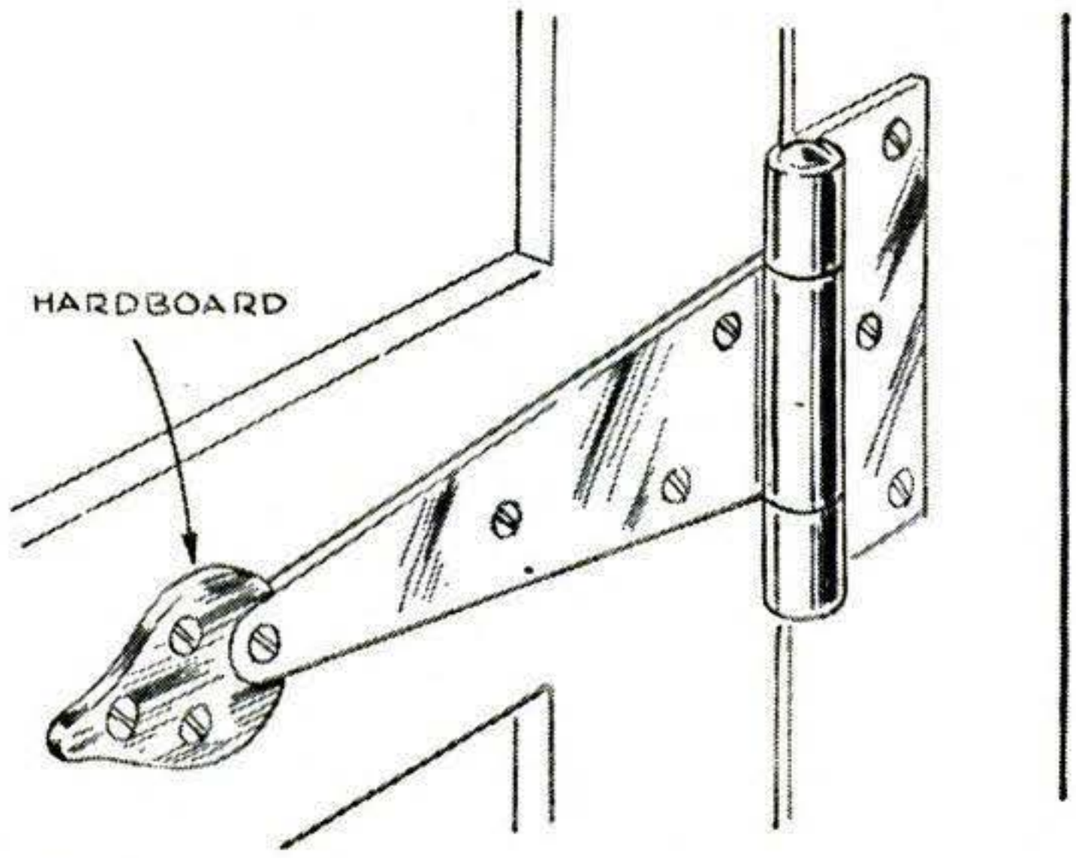
Rack on Bench Saw Keeps Accessories Handy

I STORE the accessories for my circular saw on a rack within hand's reach. It's a piece of ¾" plywood shaped to the contour of the table and attached with stove bolts. Brass L hooks support a rip fence and miter gauge, and there's still space for hooks for small jigs and other accessories.—*R. Capotosto, Flushing, N. Y.*



Nail Pinch-Hits for Wedge

WHEN a hammer handle loosens and you lack a steel wedge, square-cut nails will substitute. Drive one or two into the wood to spread it enough for a tight fit. Although ideal for the job, the wedge-shaped nails often run long and are tough to saw. I cut them off with a cold chisel, or clamp them in a vise and twist off the ends with pliers.—*M. Ligocki, Gary, Ind.*



T Hinge Takes On Colonial Look

WHEN colonial hinges of wrought iron proved too expensive, I hung our carport-closet doors on cheap T hinges. Then I jigsawed slotted endpieces from hardboard, fitted them around the tips of the hinge straps and screwed them to the door. Viewed from a little distance, the black-painted assemblies give just the effect I wanted.—*B. M. Rucker, Louisville.*

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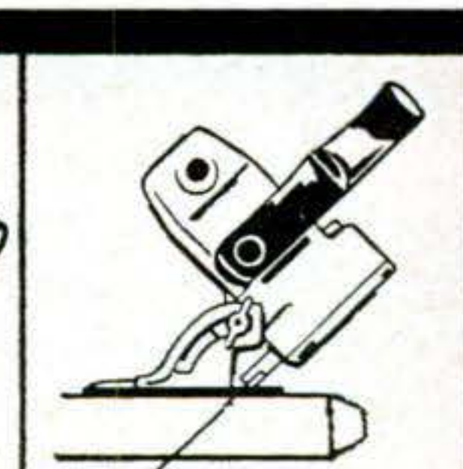

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Short Cuts and Tips

Water Steadies Jiggling Plumb Bob

WINTRY gusts often keep a plumb bob swaying for minutes on end, while you fume impatiently.

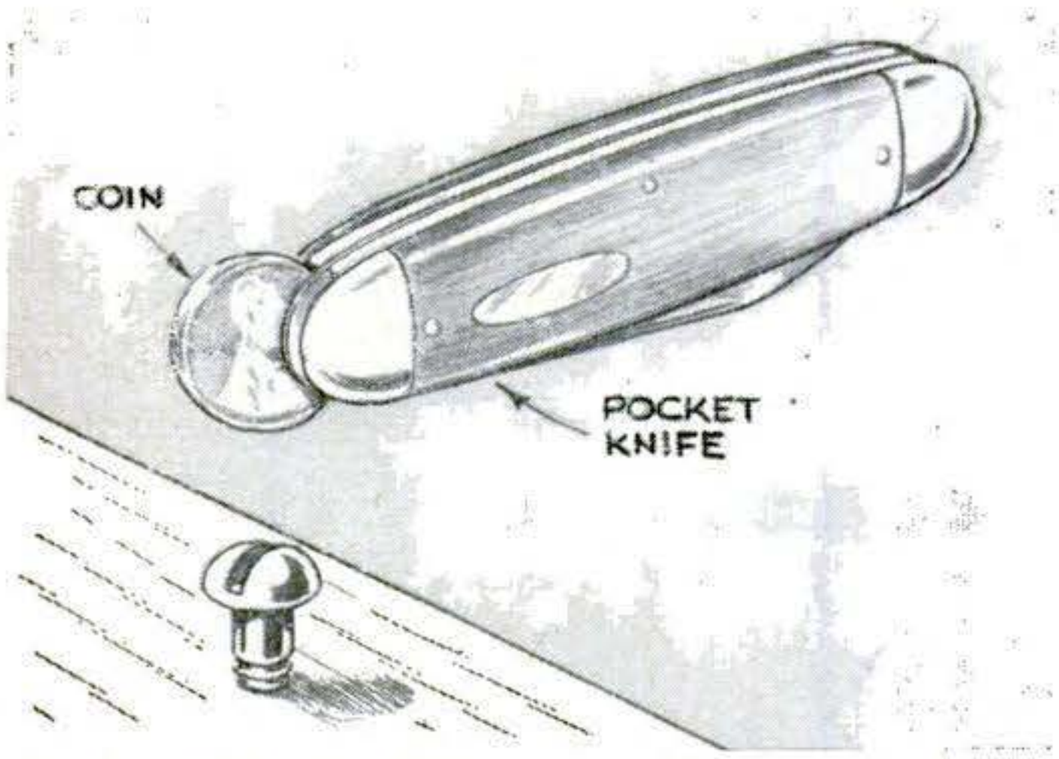
After many experiments I hit on the idea of dropping the bob in a small bucket of water. Once in the water, the plumb line quickly steadies up in even the strongest gale. This time-saver has another advantage, of course: It costs nothing.—*George Holden, Chesterfield, England.*

▶▶▶A FRUSTRATING problem in building ship, plane and auto models—especially plastic ones—is how to remove dust and dirt from them before painting.

Nothing seemed to work well, until one day I laid strips of masking tape on the model. When I pulled them off, lint and fuzz were gone.—*H. Thoenebe, Oreland, Pa.*

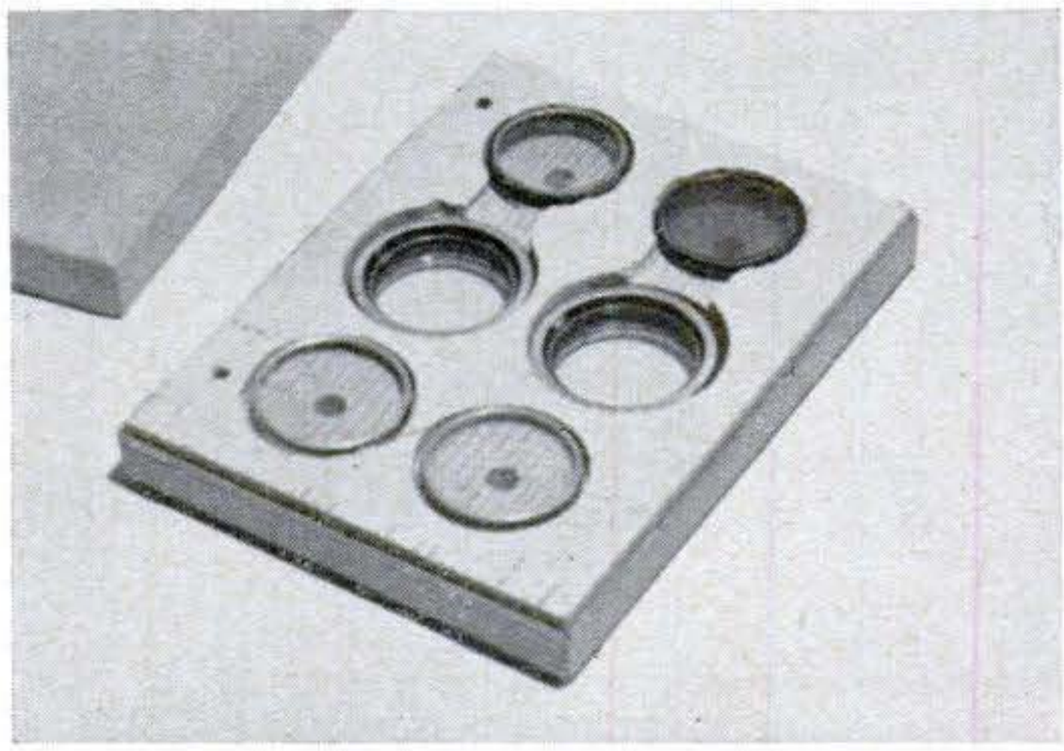
▶▶▶POSTAGE stamps that are stuck together will come apart if you soak them in water. But the glue washes off.

My system leaves the glue intact. I lay a thin piece of paper over the stuck stamps and run a moderately hot iron over the paper. The stamps separate unharmed. —*M. Robert Beasley, Jackson, Mich.*



Coin Pinch-Hits as Screwdriver

OFTEN a thin dime and a pocket knife will serve satisfactorily as an emergency screwdriver. Wedge the coin in one end of the closed knife; the coin becomes a screwdriver blade and the knife your handle.—*Norm Jacky, Seattle.*



Board Protects Camera Filters

I DRILLED blind holes in a wood block for safekeeping filters and close-up lens attachments. The board is slightly less than 4″ by 5″ and fits in a sheet-film box. A rubber band holds the box closed.—*L. Hockman, Sherman Oaks, Calif.*

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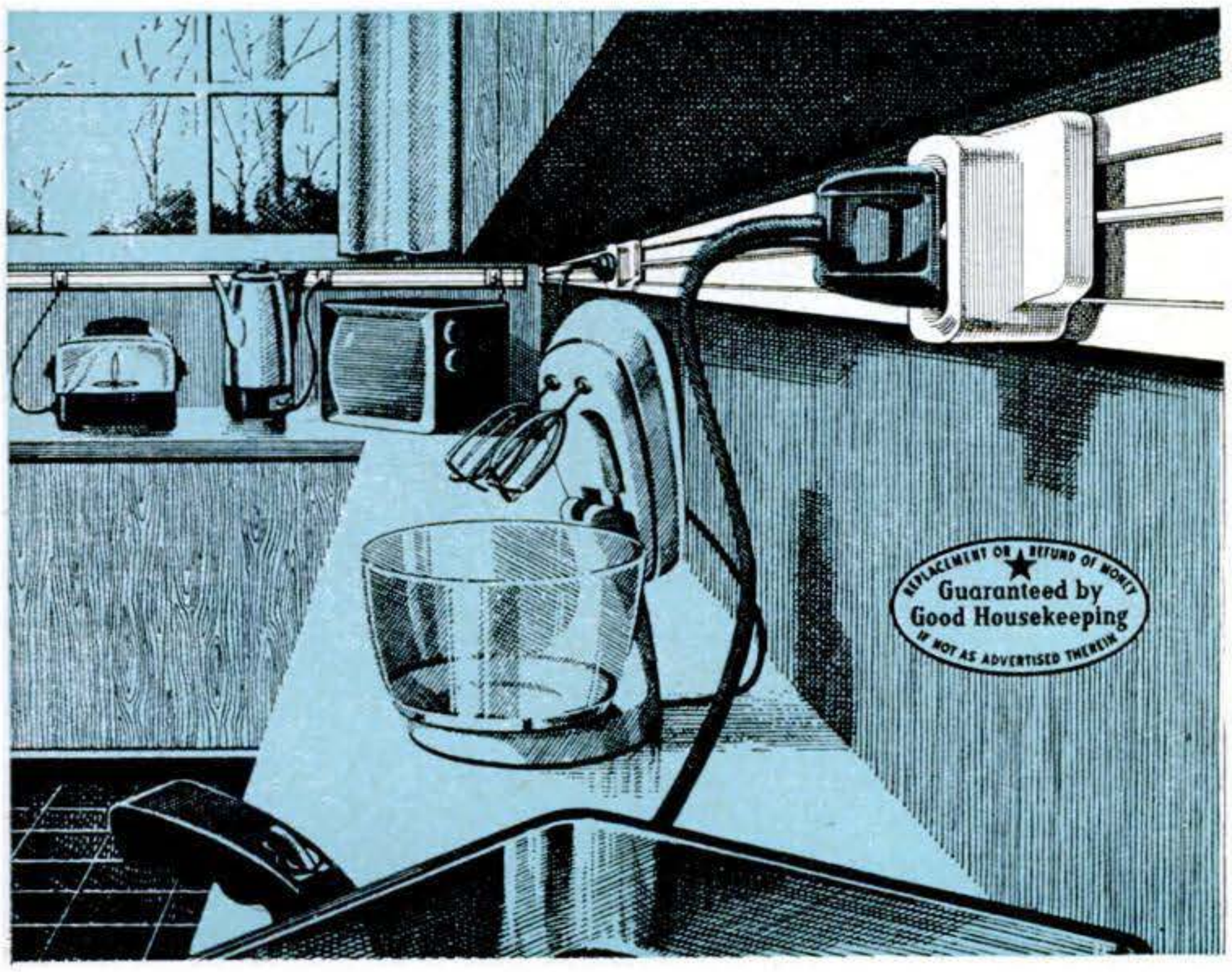

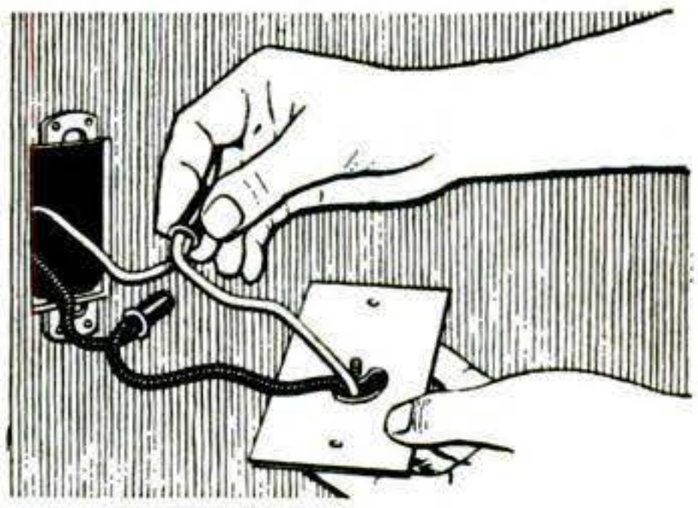

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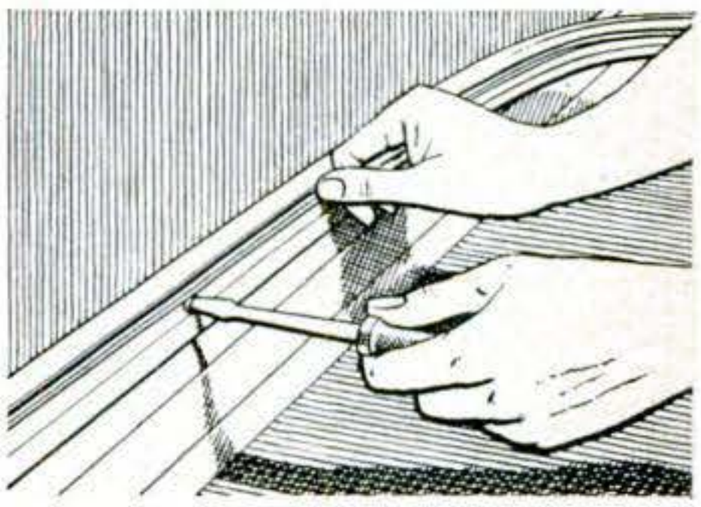

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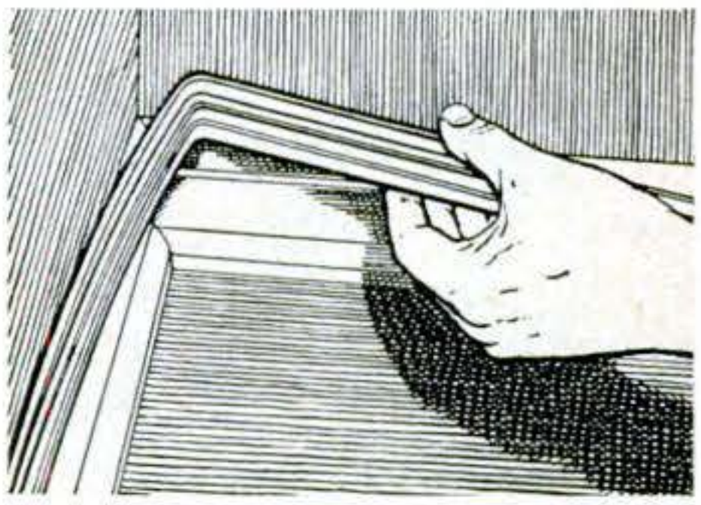

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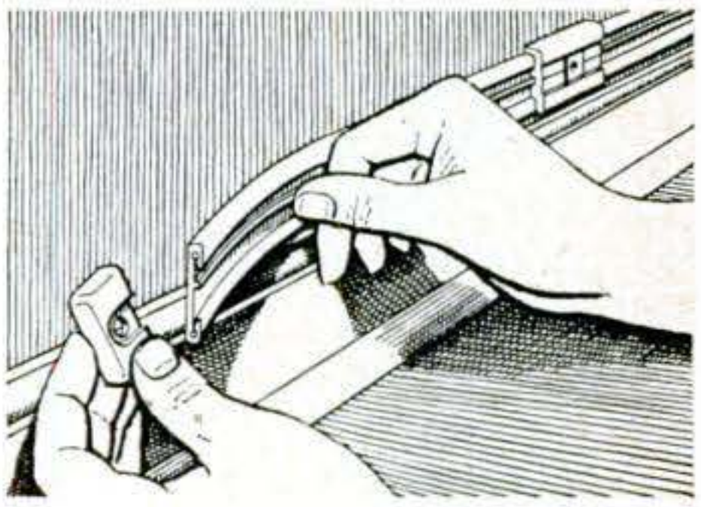

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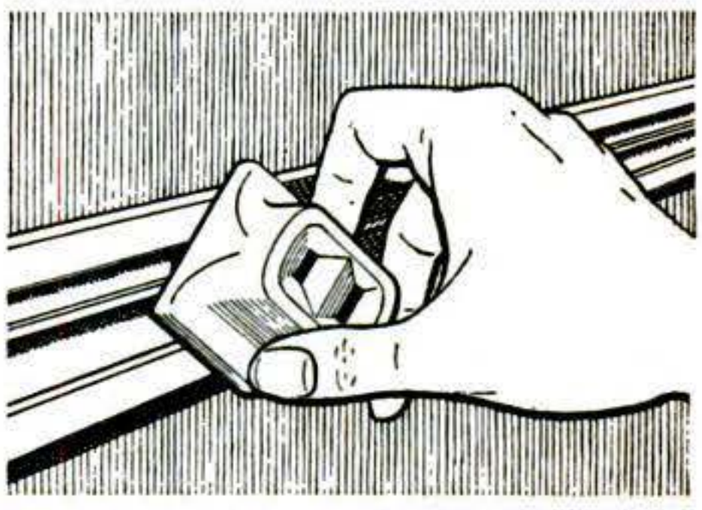

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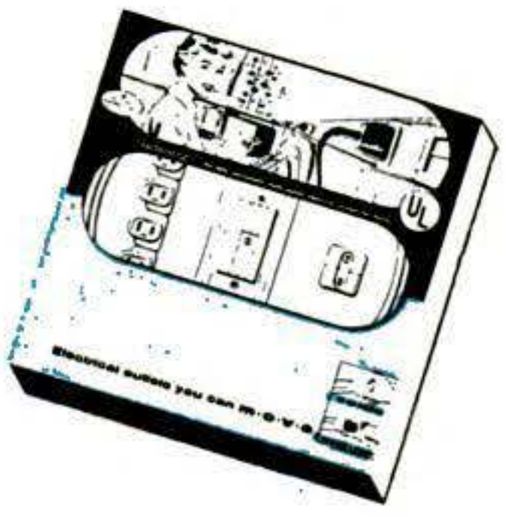

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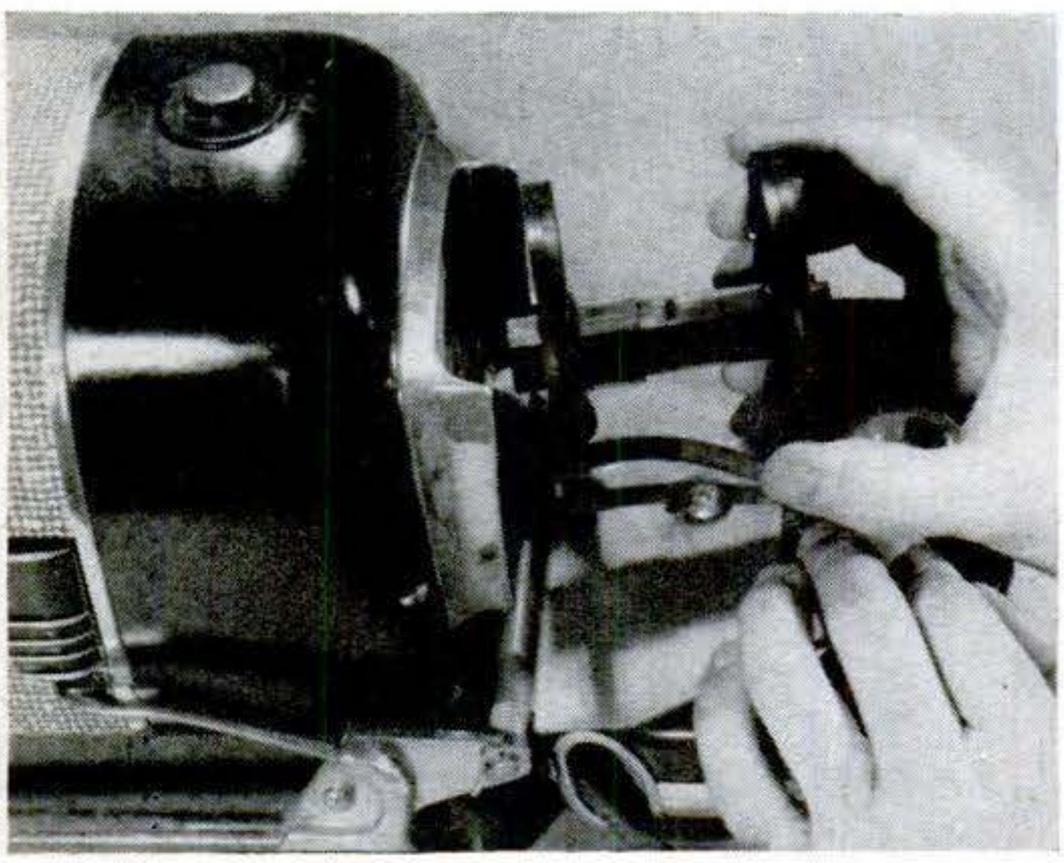
Short Cuts and Tips

'Mud Closet' Has Wet-Weather Drain

WHEN it rains or snows, the front hall or kitchen floor soon becomes awash with dirt and drippings from coats, boots, umbrellas.

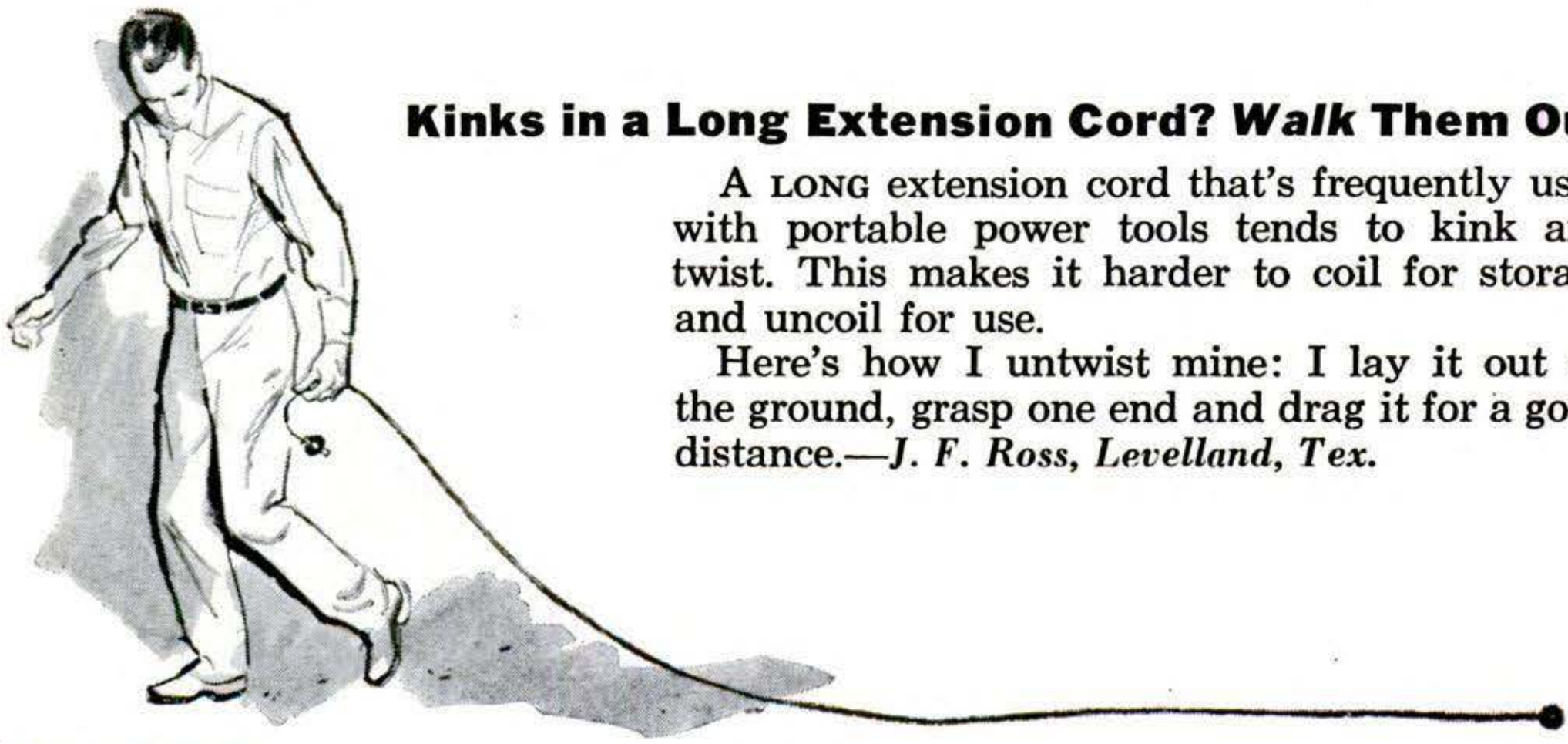
You can turn your entrance closet into a special wet-weather one by installing a floor drain in the center. Cover the rest of the floor with tile or linoleum. Now water will run off and mud can be flushed or mopped away easily.—*John L. Springer, Scarsdale, N. Y.*



Vacuum Cleaner Dries Film Reel

WINDING film on a reel is difficult if the reel is wet. When I have a lot of rolls to develop, I dry the reel after each use by holding it against the blower end of a vacuum cleaner for a few seconds.—*Kenneth M. Patterson, Tribune, Sask.*

▶▶▶IF YOUR calking gun still has compound inside when you're ready to put it away, better plug the nozzle first. A plug of aluminum foil, held in place by masking tape, keeps the compound from hardening.—*John A. Comstock, Wellsboro, Pa.*



Kinks in a Long Extension Cord? *Walk* Them Out

A LONG extension cord that's frequently used with portable power tools tends to kink and twist. This makes it harder to coil for storage and uncoil for use.

Here's how I untwist mine: I lay it out on the ground, grasp one end and drag it for a good distance.—*J. F. Ross, Levelland, Tex.*

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[Continued from page 222]

and forming ice? You have? What did you do about it? Alcohol, eh? Well, thanks for the tip, Binford."

Gus hung up, a look of triumph in his eyes.

"You didn't tell him off," Harold complained. "All you talked about was the weather. I thought you were—"

"Going to talk about your tire? Well, in a way, I did."

Harold shook his head. "My hearing's gone sour! I didn't hear tires mentioned—just the weather."

"Why not?" Gus chuckled. "In a way, the weather caused your tire to blow out."

"Come again?" the youngster asked.

"You see," Gus explained, "I know how Binford operates. To get any credit from him, you have to buy your gas there. I'll bet the air in your tires came out of his hoses—am I right?"

"Right," Harold said. "What of it?"

"When Bert Vickers crowded you, you stepped on it, even though the streets were icy. That could be a quick way to commit suicide, incidentally. In this case your left rear tire took hold, but the right spun, and developed a lot of static electricity."

"But I don't see . . ."

"In dampish, freezing weather, such as we've been having," Gus went on, "air hoses sometimes gather moisture and form ice inside. Some service-station operators put antifreeze in their hoses to prevent this. Ethylene glycol is all right, but with an alcohol-base antifreeze there's a possibility of getting alcohol fumes into the tires. Now spark a charge of static electricity in them and—boom!"

Harold scratched his head. "You mean to tell me that you could blow a tire to pieces this way?"

"Yes," Gus declared. "When I noticed a smell of alcohol around that blown tire, I remembered a bulletin sent to me by a well-known tire firm. It warned dealers not to use alcohol in their air hoses to prevent icing, and told of several tires blown apart just that way."

"How could they be sure that's what did it?" Harold asked.

"They proved it," Gus said. "Welded a spark plug into a wheel rim, injected a little alcohol into the tire, then furnished a spark. The test tires blew the way yours did, with the bead torn."

Harold's eyes lit up. "Gus, can I hang this on Binford?"

"It was his alcoholic air that did the damage, wasn't it?" Gus asked dryly. "Here, take this bulletin to him. Tell him Gus Wilson said when they send free information, it pays a man to read it."

"That won't pry a new tire out of him."

"I wouldn't suggest that you blackmail him," Gus said. "But you might say what a good story this alcohol business would make. If that doesn't work, then get him to phone me."

"The doors, Mr. Harris! Close the doors!"

GUS didn't expect Binford to phone. Nor did he, but about five o'clock Harold Strom drove slowly by the Model Garage, tooting his horn and holding up two fingers in the victory sign.

Stan looked up to catch a gleam of satisfaction in Gus's eyes. "Enjoyed that little ruckus with Binford, hey, Boss?"

"Yep," answered Gus. "That was some blowout Harold had. You might say we both got a bang out of it." END

NEXT MONTH: Gus meets competition.

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FOR — • SNOW PLOWS • TO DUMP FARM WAGONS • ADJUST DEPTH OF PLOWS • HYDRAULIC PRESS • HYDRAULIC JACK. THE COMPLETE KIT CONSISTS OF: 1—Walker Hydraulic Hand Pump—Rated 1500 lbs. per sq. inch with 2 gal. hydraulic reservoir • Release valve • Filler plug and air vent • 28" steel handle. Fine for hydraulic presses; snow plows, jacks. Dimensions: 6" Diameter, 29" long with 3/8" pipe thread port. Pump Assembly Item #P449..... **23.50**

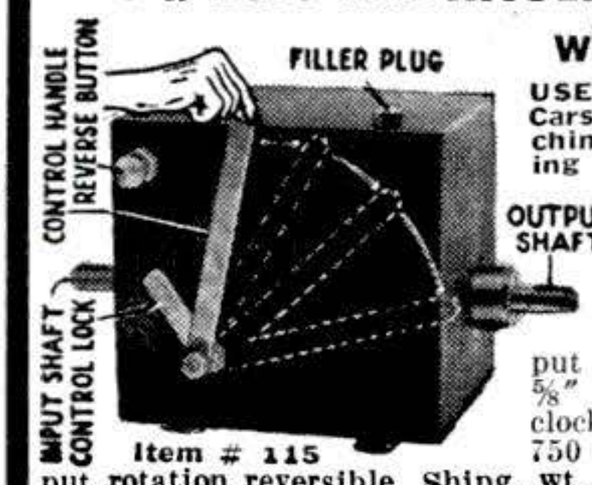
1—6 Ft. length double wire braid rubber covered hydraulic hose—tested to 20,000 lbs.! Item #27B4. **3.95**

1—Hydraulic Cylinder, 3" bore, 6" stroke. Husky 3/4" solid steel shaft. Will lift 10,000 lbs. using 1500 lbs. of pump pressure. Clevis mountings that take 3/4" diameter pins. May be used for single or double action service. Overall length 17 1/4"—retracted. Item #C419..... **12.50**

1-Gallon hydraulic fluid furnished free with each kit. Plus all necessary hydraulic fittings. Total ship wt.—40 lbs.

COMPLETE KIT PRICE (ALL OF ABOVE INCLUDED).... **38.95** F.O.B. CHICAGO

1½ H.P. HYDRAULIC SPEED REDUCER with FINGERTIP CONTROL

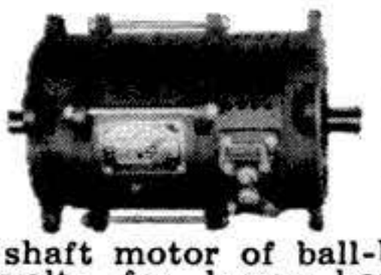


Item # 115

USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/4 to 1½ H.P. Shafts 5/8" diam. Input rotation counterclockwise facing shaft. Input speed 750 R.P.M. 7½"x7½"x11½". Output rotation reversible. Shipg. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago..... **72.50**

1 H.P. 12 VOLT ELECTRIC MOTOR



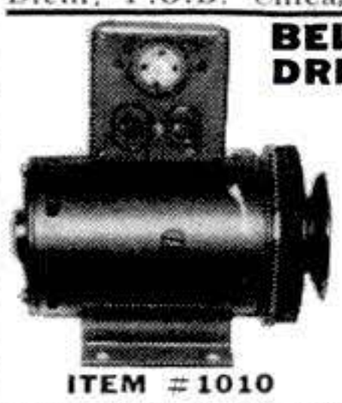
ITEM #308 — • For electric wheel chairs (Pop. Mech. design—Mar. 1953).
• For electric golf carts.
• For self-propelled scooters, children's midget cars.

Rated 1 H.P.,—100 amps., 5600 R.P.M., 12 volts, D.C.—This double shaft motor of ball-bearing construction may be run on 6 volts for lower horsepower requirements—Standard 5/8" shafts, flange mountings.—Dimensions: 9" x4½"x4½". Ship wt. 19 lbs. A real value at **12.50** F.O.B. Chicago

2 H. P. ELECTRIC MOTOR

ITEM #315—24 Volts, 90 Amps., 4000 RPM, Spline shaft both ends. Style similar to above. Mfgd. by Hobart or Diehl. F.O.B. Chicago..... **13.00**

BELT DRIVEN A.C. GENERATORS



ITEM #1010

Ideal for powering electric tools, oil burner, refrigerator, lights, or other appliances requiring up to 1000 watts of power. **1000 WATTS,** 115 Volts, 60-cycles A.C. 3600 R.P.M. Compact, self-regulating generator with V Belt pulley and double outlet receptacle. Rotation counterclockwise. May be driven by tractor or auxiliary gasoline engine. Requires 2½ HP minimum. Dimensions: 10" long x 8" high x 6" wide. Shipping wt. 27 lbs. F.O.B. Chicago..... **79.50**

MODEL 700 750 WATTS A. C. Generator F.O.B. Chicago..... **59.50**

MODEL 2000 2000 WATT A. C. Generator F.O.B. Chicago... **133.00**

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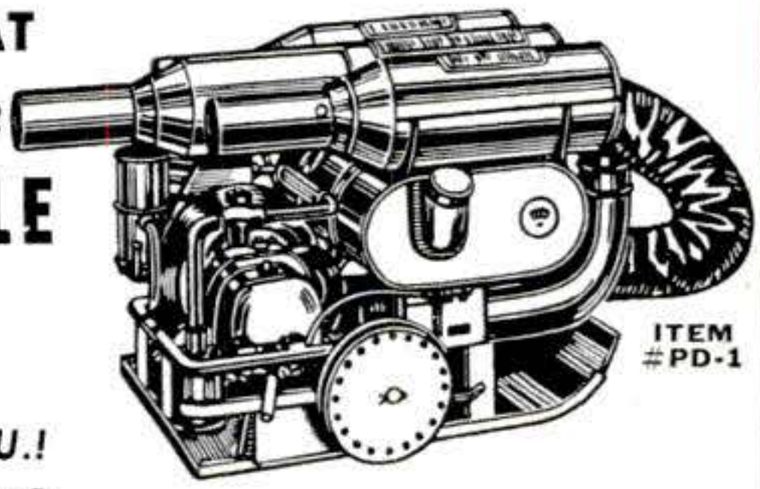

ITEM #PD-1

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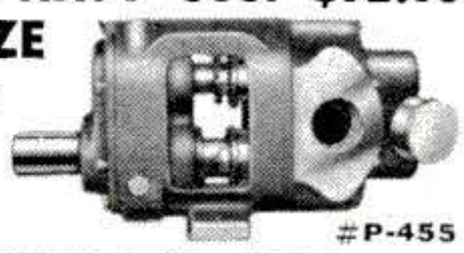

#P-455

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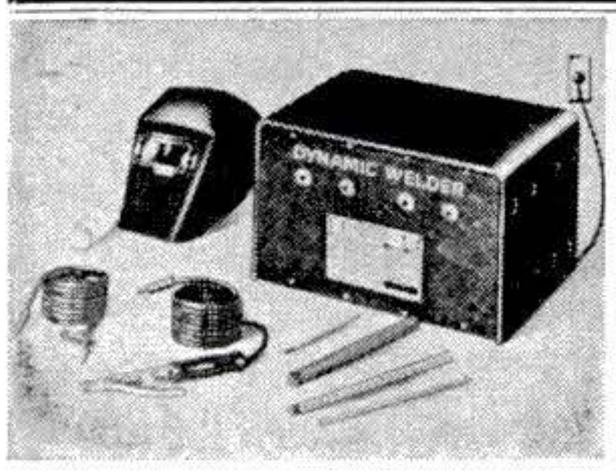

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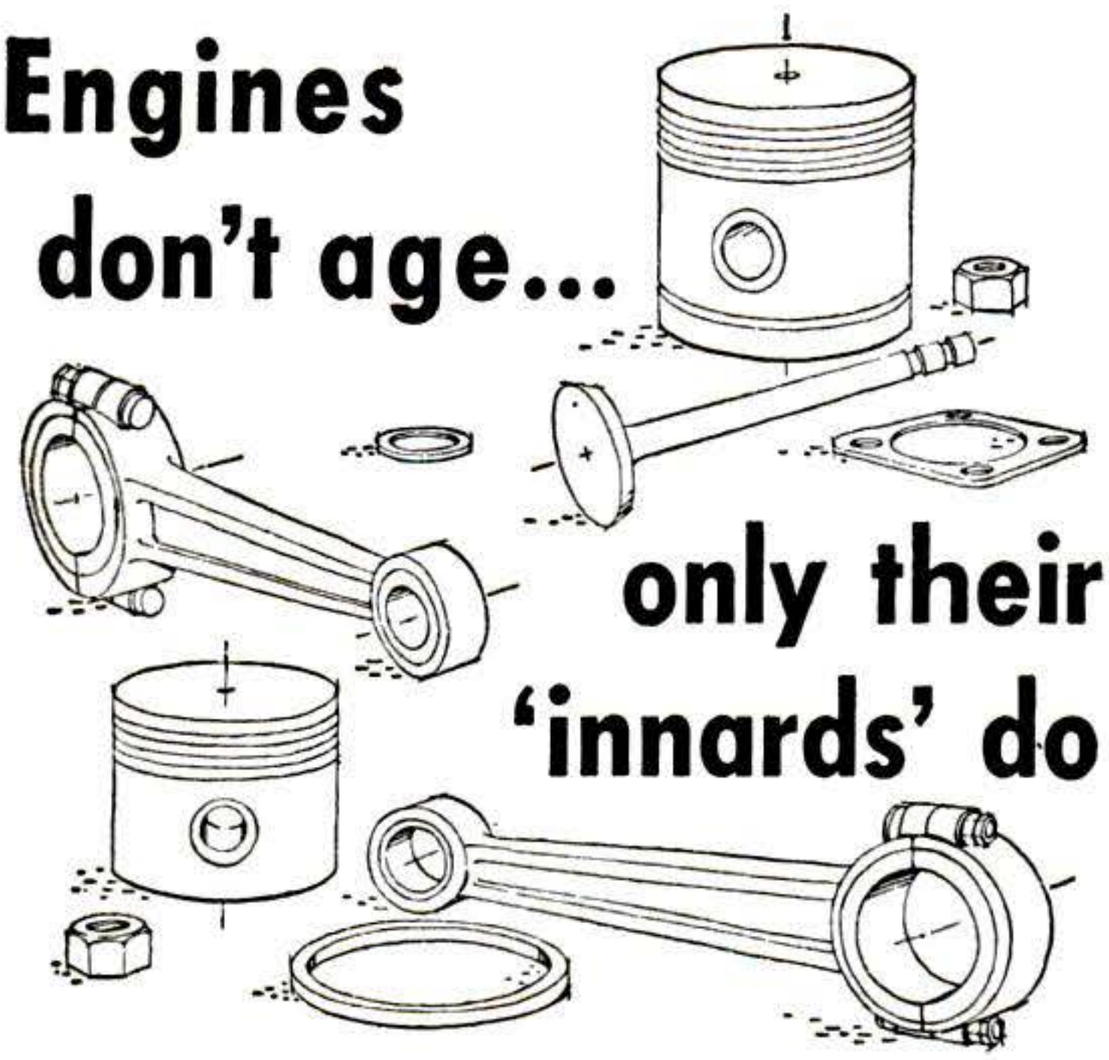

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The Truth About Air Springs

[*Continued from page 112*]

The closed system must add a large low-pressure tank. It seldom needs outside make-up air.

Rapid leveling. When Cadillac brought out its Eldorado Brougham in '57, it was the first American passenger car to use air suspension. Because they couldn't find room in the engine compartment for a large, engine-driven air compressor, they used a small-capacity electric job. Then, because the air supply was limited, they used extremely slow valving on the springs for normal operation—to conserve air. This gave a leveling time of almost 15 minutes if the normal valving were depended on to do the job. Since this was too long in the case of passenger-load changes, they added a rapid-acting bypass system, to go into action when the doors are opened.

Ford and Mercury use a similar system in their air jobs this year. When the door is opened, a solenoid is actuated that feeds air through a secondary system of air lines and this opens a bypass valve within the leveling valves, allowing the air springs to fill or discharge quickly as the load changes.

With their engine-driven compressor, there is much less need for being miserly with the air supply—but the door-opening trick does make a neat showroom demonstration and a wonderful gimmick for impressing the neighbors.

Operation bootstrap. Every driver of a low-slung Detroit chariot who has to back it out of a steep driveway every morning will cherish a feature incorporated by Buick, Olds, Pontiac and Cadillac. A control under the dash lets you boost the car an average of five inches above normal. It's just the thing, too, for untangling locked bumpers or opening a door when you're against a high curb. This tricky bit of levitation is accomplished by a manual override valve that directs air from the high-pressure tank into the exhaust lines, bypassing the leveling action of the valves and pumping up the air bags to their full extension.

This feature came out of a search for a solution to the awkward problem posed by jacking a car to change a flat. The automatic leveling system can't know that when you put a jack under one corner of the car you want to lift just

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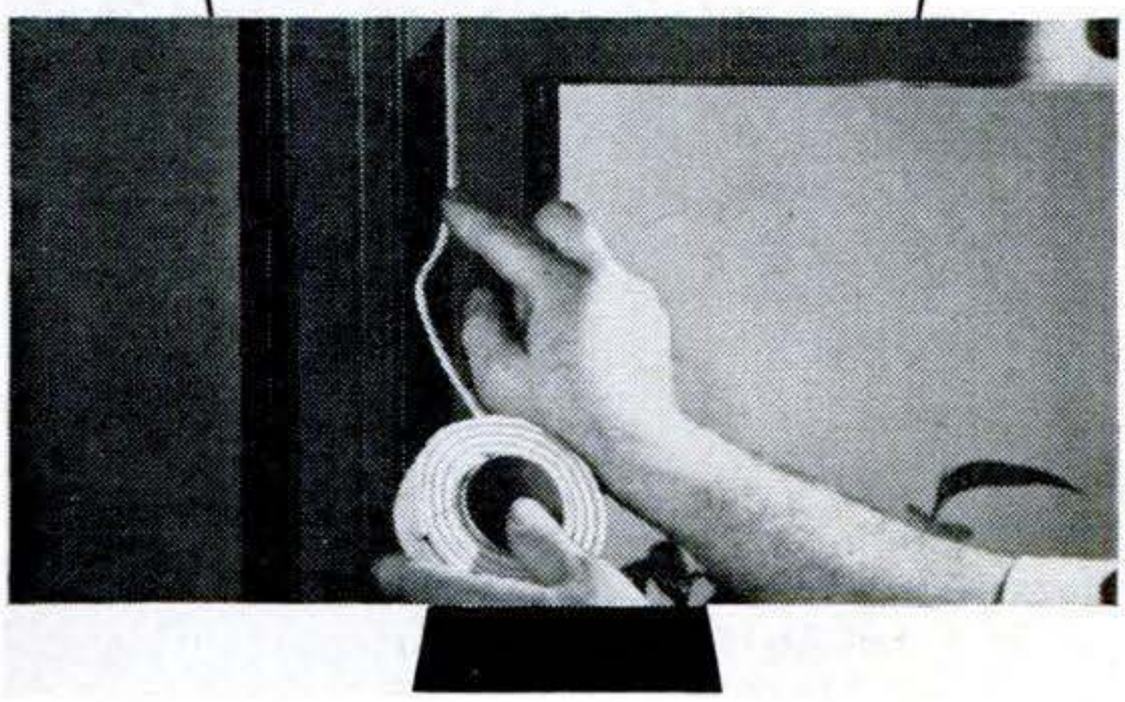

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?? SHOP QUIZ ??

Question 1

What's the **EASIEST** way to drive wood screws?

Question 2

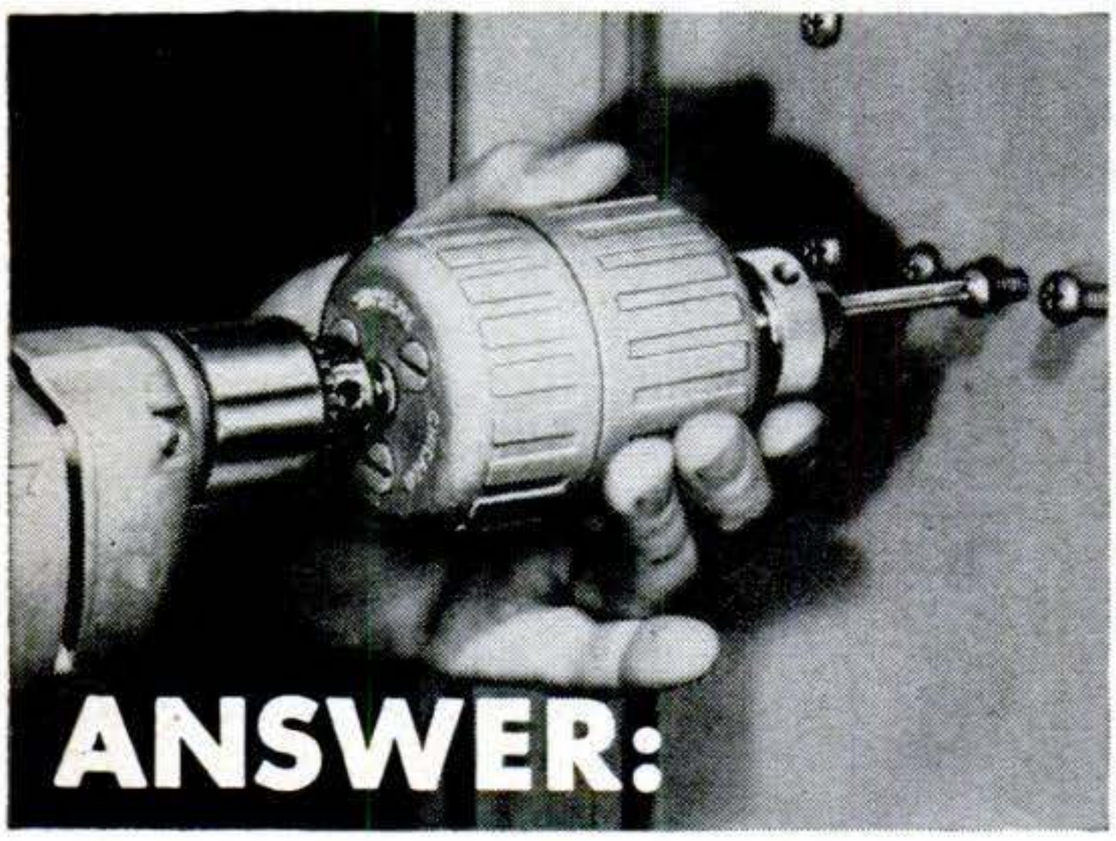
What's the **EASIEST** way to remove wood screws?

Question 3

What's the **EASIEST** way to run nuts or bolts on or off?

Question 4

What's the **EASIEST** way to use heavy-duty cutting tools like hole saws, masonry and auger bits?



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that corner. The more you work the jack, the harder it tries to keep the car level. The manual override valve not only bypasses the leveling action but does the first five inches of jacking for you.

Chevrolet and Mercury don't completely ignore the problem—they give you a special jack to cope with it.

Where to put the leveling valves? It might seem logical to locate two valves in the rear, where the greatest variation in load takes place. The third leveling valve could be placed in front near the center, to give average leveling where there is least variation in load. This is the arrangement used by Buick, Olds, Pontiac and Cadillac.

Mercury, Ford and Chevrolet do just the reverse. The single valve is near the center on the Ford and Mercury. On the Chevrolet, it's on the left side.

The problem of leak-down. No mass-produced, cost-pared system is likely to be absolutely airtight. Some manufacturers have set two weeks, others a month, as the minimum period, without use, before a car deflates down on its haunches. A few engineers argue that leak-down doesn't really make any difference since the car assumes normal height as soon as the engine is started. Perhaps it won't be a major problem, but some six-foot drivers will not be delighted by the gymnastics required to get in and start the engine when the car is sprawling down on its axles.

In terms of flexing life, the durability of the airbags has been thoroughly tested and promises to be as good as that of coil springs. But aging of the rubber is another story, and may be a cause for wariness by future secondhand buyers.

The most vexing headache with air suspension may very well be clogging, freezing or other malfunction of the valves. The limited testing done by the manufacturers so far has not turned up serious troubles, but engineers have their fingers crossed. Oldsmobile in particular has gone all-out to guard against such unhappy possibilities—multiple air filters, an oil-and-water separator, and a completely closed system. Say other engineers, fingering their rabbit's feet, "Our tests have not uncovered troubles, so why add extra cost that may not be needed? We'll wait and see." END

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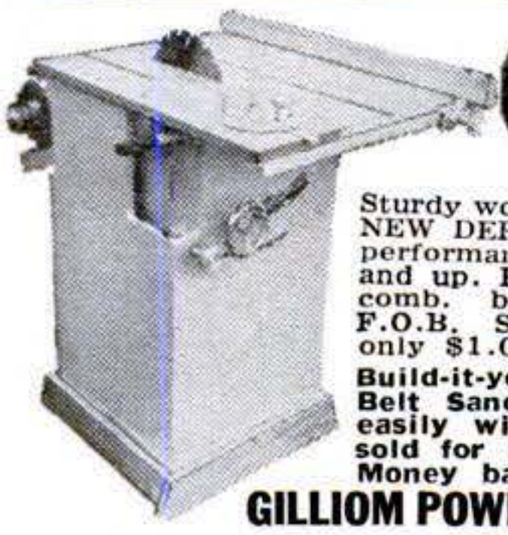

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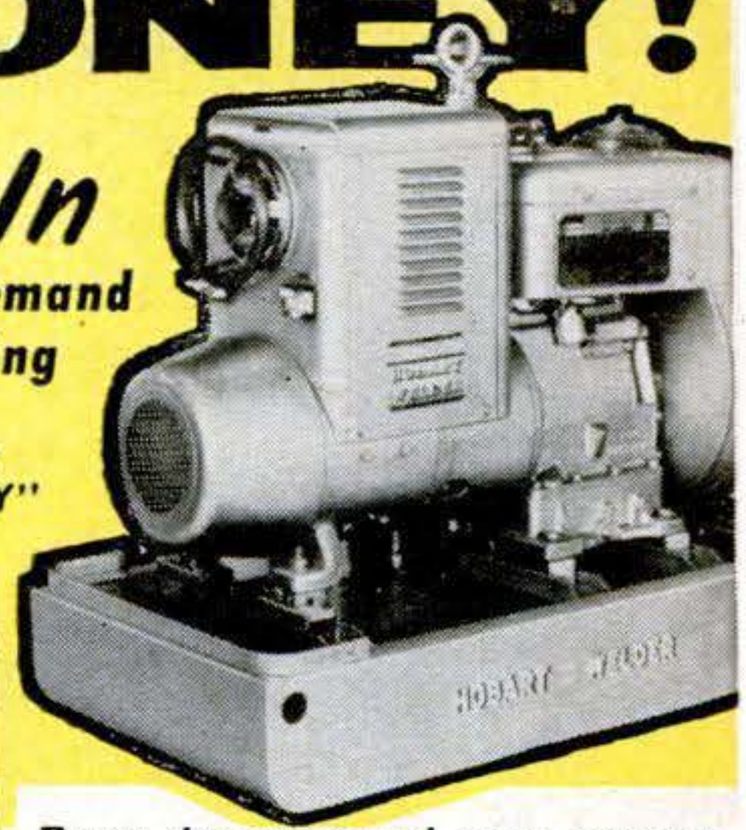

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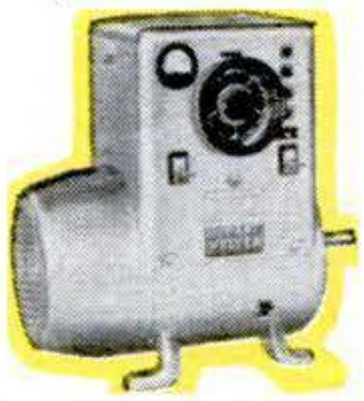
AC Transformer Shop Type Welder



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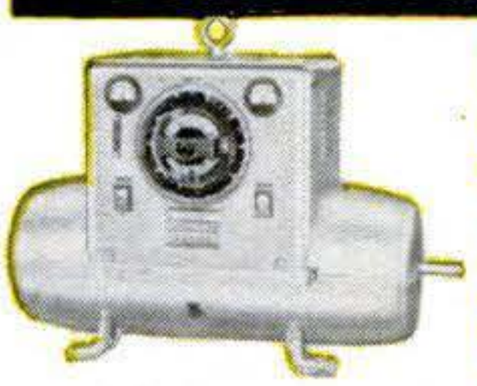

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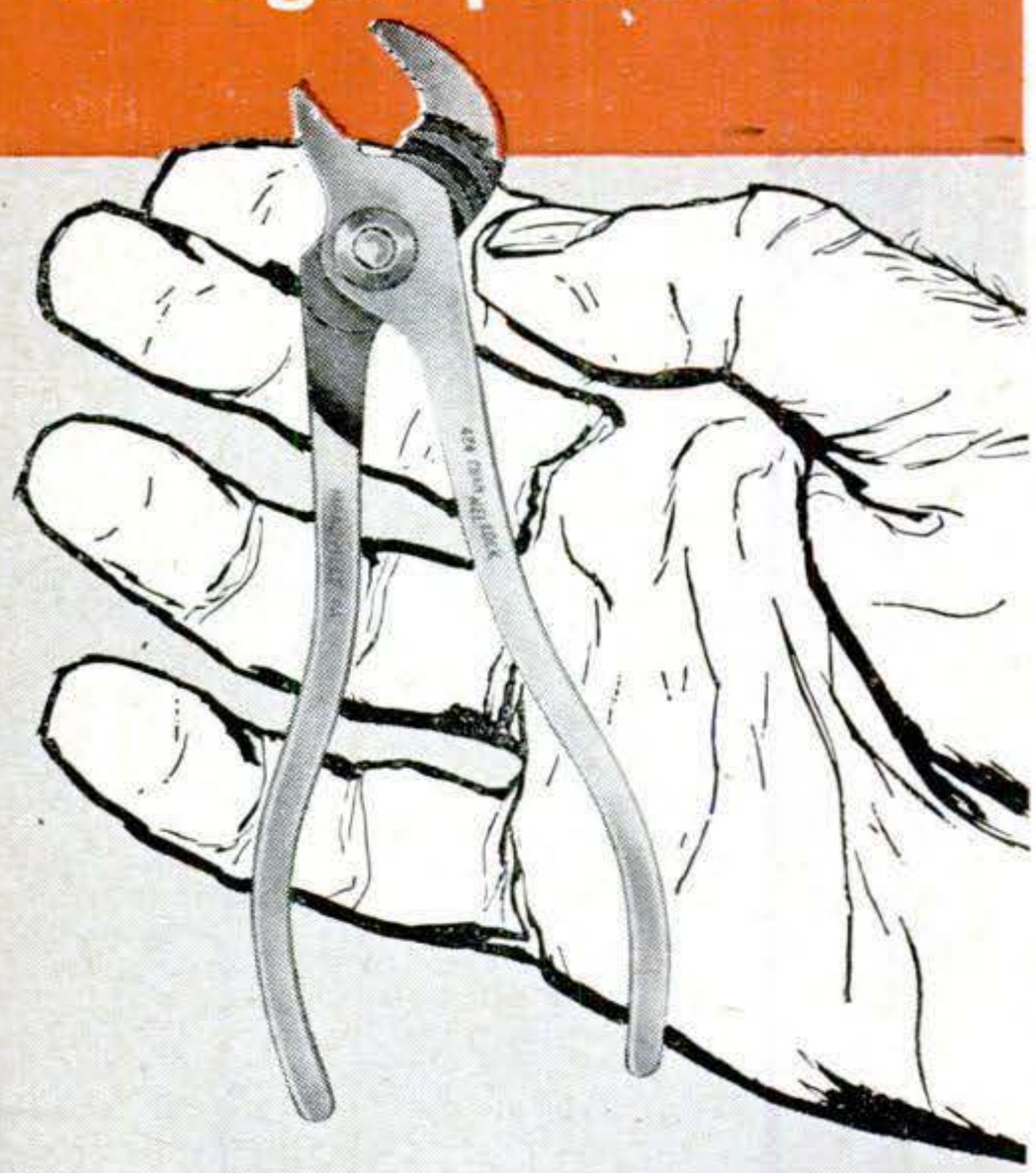

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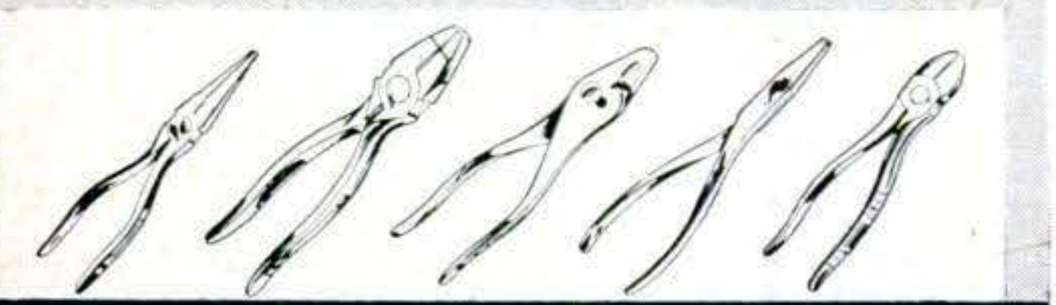

Be sure its a genuine CHANNELLOCK
Look for the trademark on the handle

Why Girls Are So Good

[*Continued from page 161*]

of the girls said they felt as secretive.

Girls are really needed. Many students of delinquency think our boys get into so much trouble today partly because we no longer need them. Several generations ago, when the family living was earned on the farm or in a small-town business, a father needed all the boys he could beget. They pitched hay, milked cows, chopped wood, ran errands—made a real contribution to the family. Today we have millions of adolescent boys bursting with physical strength, energy and imagination—and nothing really important to do. They are not fooled by the "made" chores that parents think up. They feel surplus—and they're right. Girls, however, are still very much needed. Baby-sitting is rapidly becoming one of the country's multi-million-dollar businesses. In many homes a teen-age daughter is expected to help keep the house straight, mind the younger children, peel the potatoes and set the table. Such teen-age girls have the dignity and self-respect of people who know they are doing needed work. It helps them stay good.

This, then, is how the sociological and psychological evidence stacks up. Girls get into less trouble because life is often more restricted for them when they are little; they are already set in a "good" day-to-day groove, and as teen-agers they are freer of perplexing decisions as to how to act. Then, home duties give them a feeling of belonging that comes harder to their brothers.

Can we use this information about our daughters to help our sons? Social scientists think perhaps we can.

Ask yourself these questions if you are the parent of a boy:

1. Do I let him get away with more mischief and misbehavior than I would allow his sister, just because he is a boy?
2. Do I let him stay out later, ride his bicycle on more dangerous roads, climb higher trees, for the same reason?
3. Do I put up with more rudeness, disobedience and non-performance than I would with his sister?
4. When he is injured am I more concerned with telling him, "Grit your teeth" or "Be brave, son!" than letting him know I'm sorry he's in pain?
5. If he blows his top, do I dress him

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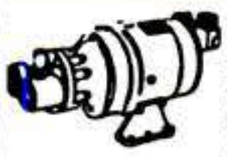

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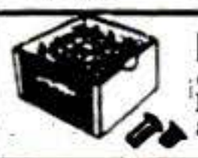

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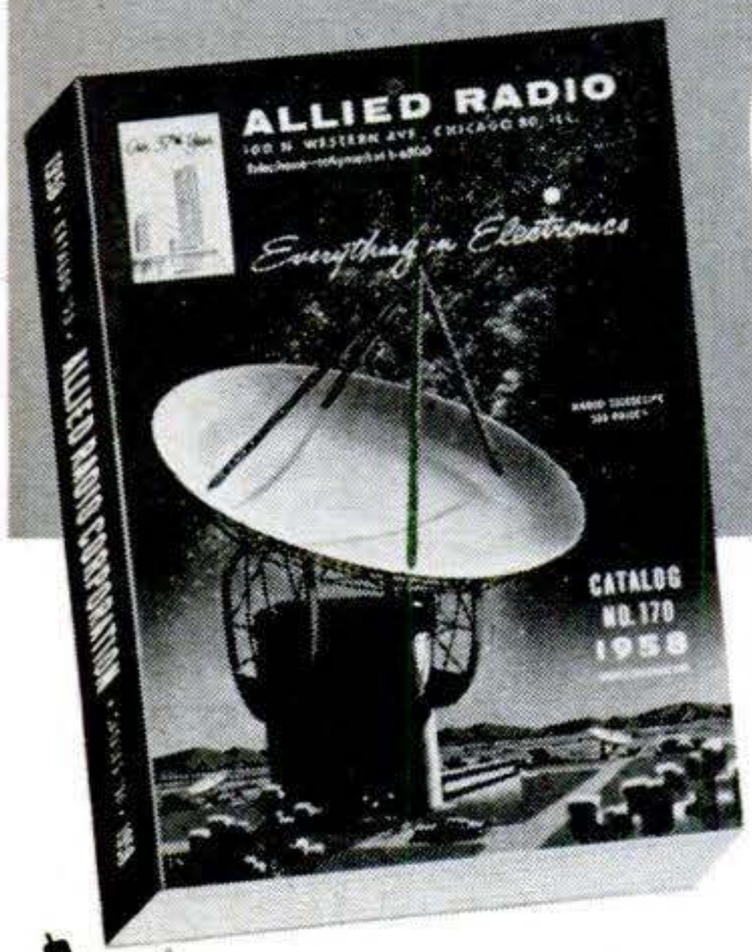

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down for it harder than I would his sister when *she* lets go?

6. Do I try to guide his tastes in recreation, sports and intellectual interests more than I would his sister's?

7. Would I sooner give him a new football than a book?

8. Do I tell funny stories about my own mischief-making years without making clear at the same time what a nuisance I was?

9. Does my daughter say "How do you do" and "Thank you" more readily than my son?

10. Do I fail to give my son the feeling that self-respect is more important than success?

Generally speaking, a majority of "yes" answers may mean that you are pressuring your son to live up to your idea of masculinity and manhood. You are, perhaps, restricting your daughter more than you need to.

Yet the truth is, there are no pat answers to these questions. They are designed to help you take inventory in your own family. Should our boys be "better" than they are? Should our girls be less restrained than they are? Are we overexposing both our sons and daughters to cut-and-dried ideas of male and female behavior that seemed just right in Grandfather's day?

One conclusion the authorities we talked to agreed upon. Our boys often get into trouble because they receive comparatively little restriction in their early childhood years and are then forced to face problems too difficult for teen-agers. Our girls are "good" because they are severely restricted in their early years but grow into a teen-age life that is easier, more orderly and less frightening than the daily lives of their boy friends and brothers.

What can a parent do about it? Two things, according to the authorities: First, encourage our boys to build a set of inner values—especially self-respect and awareness of others—as we encourage our girls. Second, help our girls find the initiative, the broad horizons that we show our boys. It is not easy to strike this happy medium. But the social scientists tell us that *aiming* at it will mean fewer juvenile delinquents and more teen-agers worthy of the care we give them. **END**

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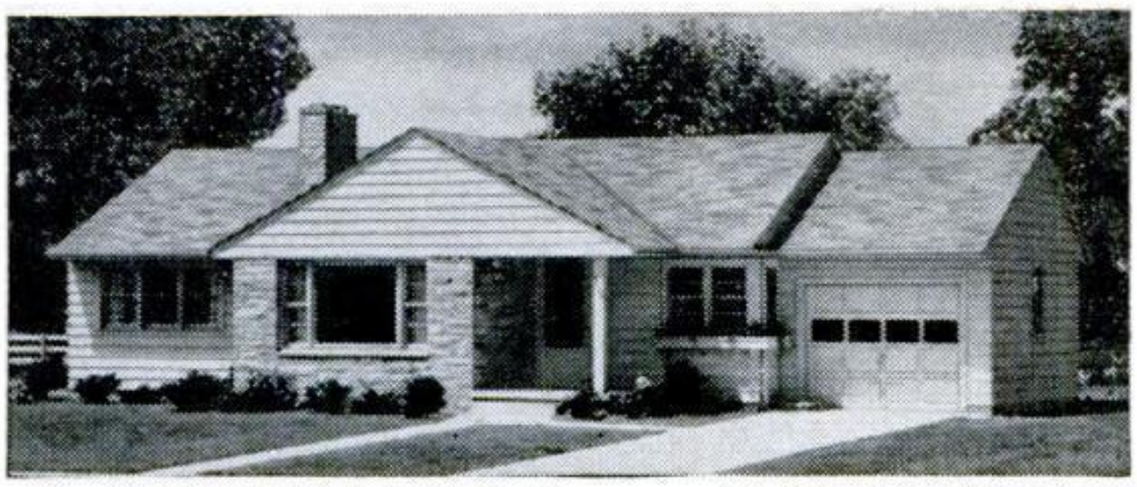

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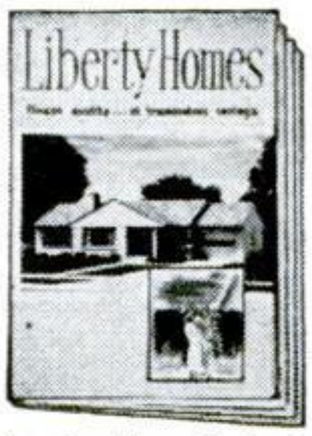

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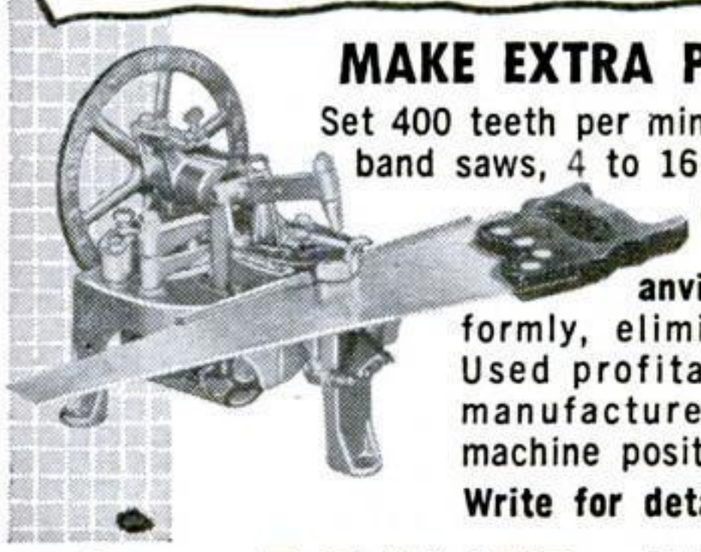

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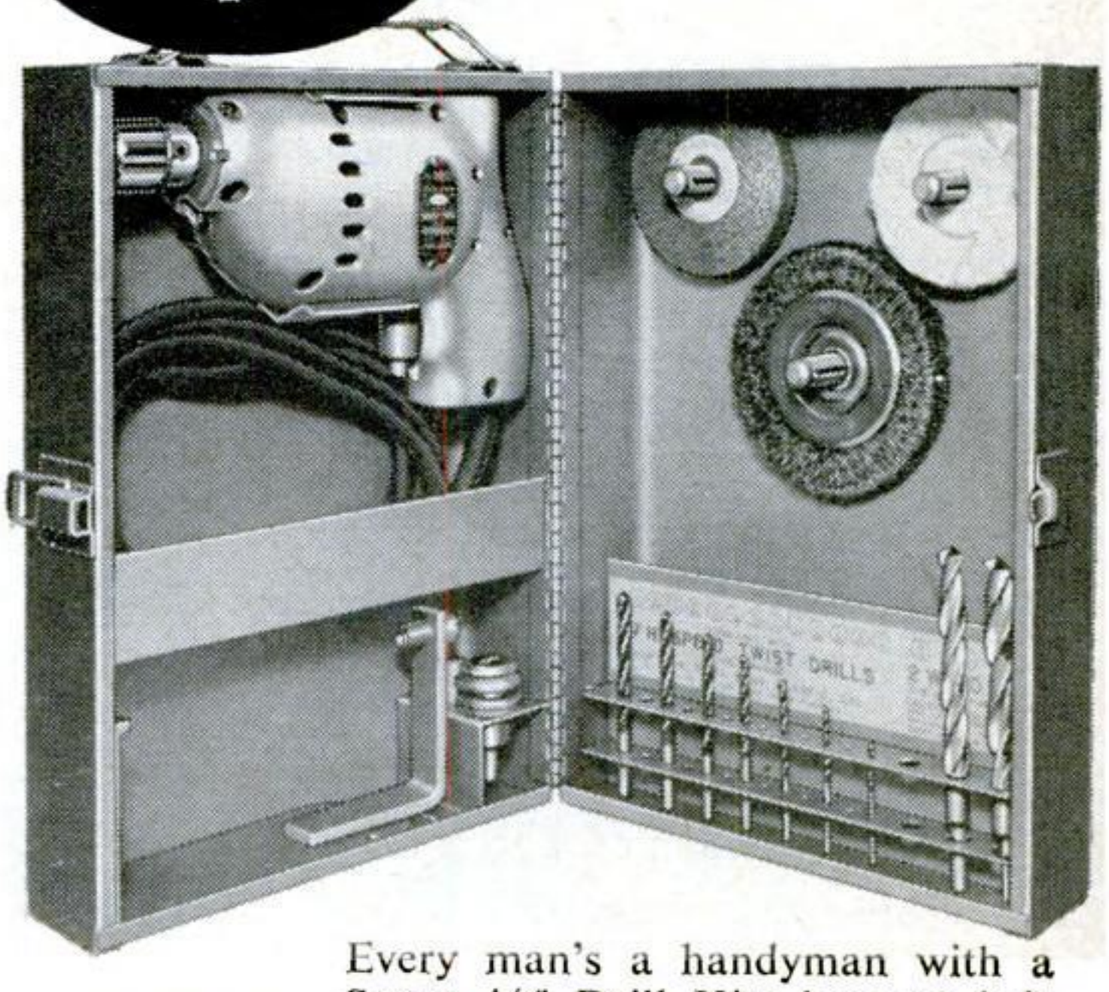

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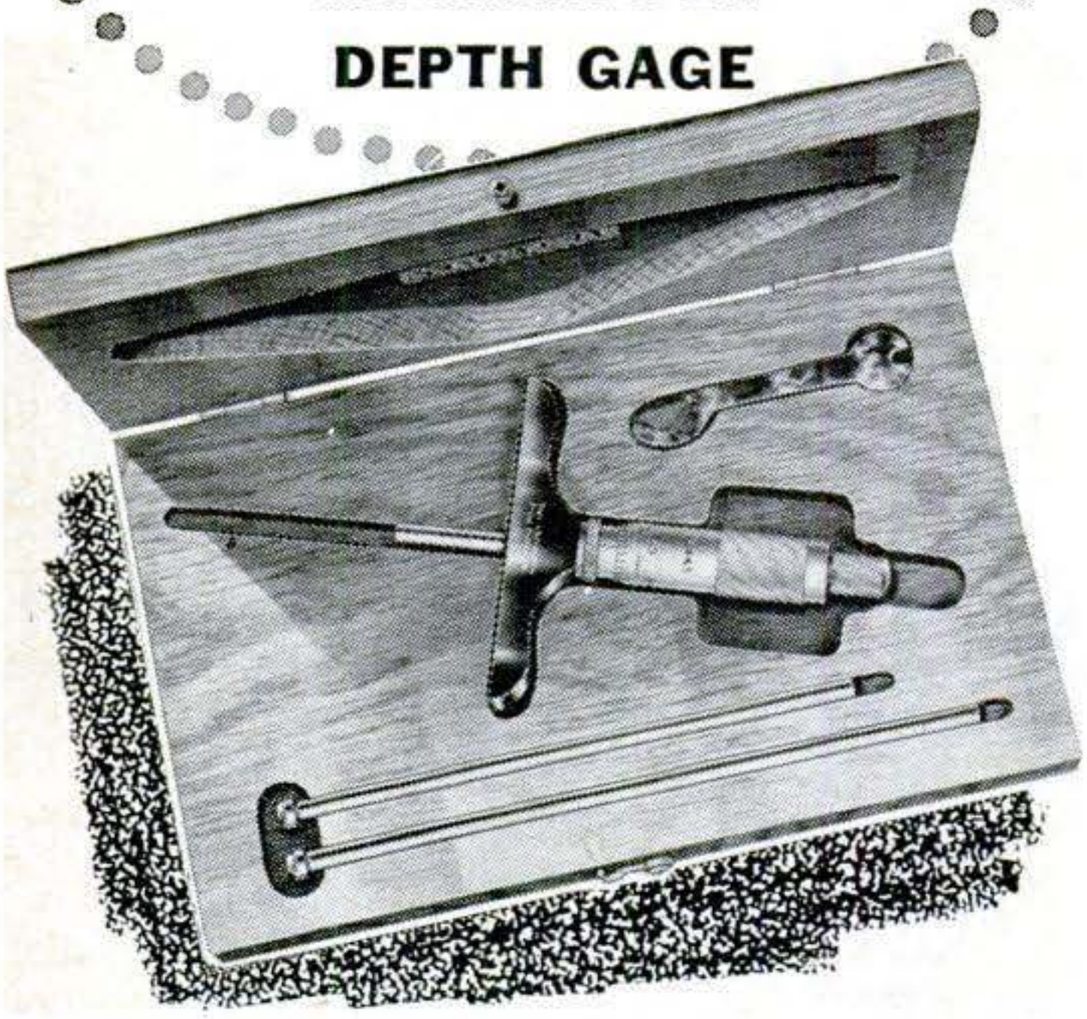

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Learning a Trade in the Service
[*Continued from page 165*]

USAFI will administer. Thousands of GIs have earned high-school diplomas in service by passing GED tests showing that they had absorbed the equivalent of a high-school education. Thousands of others have received college credit by passing college-level GED tests.

7. *College at government expense.* One way your youngster might get into West Point, Annapolis or the new Air Academy is to enlist. Each year about 150 enlisted men win appointments, most of them to Annapolis. The competition is stiff, though.

There are other college opportunities, too. To cite one: An airman who lacks only one semester to get his college degree can apply for leave—as much as eight months with full pay and allowances—to complete college work. His studies, however, must be pertinent to his military assignment.

Is the training really education? The armed forces have one aim: victory in battle. They spend all this time and money on education simply to make sure of that objective.

So it's unrealistic to consider your youngster's military service a genuine substitute for civilian schooling. He would probably learn more, in less time, by attending a technical institute, trade school or junior college, or by taking correspondence courses. Of his total enlistment time in the armed forces—three or four years, depending on the service he chooses—schooling might occupy only a small fraction. Although, of course, on-the-job training and *doing* must be counted in as education.

The most frequent criticism made of military schooling is that it is too narrow and specialized. The argument is that the GI learns how to operate a specific military mechanism, nothing more. Maintaining radar, for example, is not the same thing as repairing TV sets. Repairing a tank is not exactly like working on a Chevrolet convertible.

Most of the experts I checked gave little weight to this objection. An executive at General Dynamics Corp., for example, said the limitations of military training are no problem "if we can pick up the ball and train the man further when he leaves service." An Air Force officer was

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even more emphatic. Service training, he insisted, is even broader than industry's. "It has to be," he explained, "because the Air Force must be able to transfer men at a moment's notice from one part of the world to another, where conditions and equipment may be different."

What does industry think? I asked many businessmen—training and personnel executives—about the educational benefits of military service. The great majority of them replied favorably.

Said the personnel supervisor of one of America's leading electronics firms: "We find the training men obtain in military service to be of considerable value to us in our laboratories and service operations."

NEXT MONTH: Climb into the cockpit of a Bell X-2 rocket plane and take off at dawn with Lt. Col. Frank K. Everest Jr.—"the fastest man alive" —for an epoch-making assault on space. Don't miss "1,900 M.P.H." in February Popular Science.

The director of technical recruitment at a major oil company said: "We are greatly impressed by the value of military training. The man can often assume administrative responsibility much more rapidly than usual."

Industry's attitude was summed up by Henry Ford II, president of the Ford Motor Co., who put it in these words:

"A background of technical training in the Army is a valuable asset. Successful completion of one of the many courses in the Army's technical schools is a distinct advantage for the veteran interested in related work in civilian life."

But the most convincing evidence of industry approval is the difficulty that all the services face in getting technicians to re-enlist. As fast as they are trained, industry hires them away.

Today, military service can help your youngster get ahead. Don't expect too much. He won't get, free, the equivalent of a diploma from Harvard—or RCA Institutes. But a variety of opportunities for high-caliber training will almost be forced upon him.

Using them wisely, your son will return to civilian life with a head start up the ladder of a successful career. END

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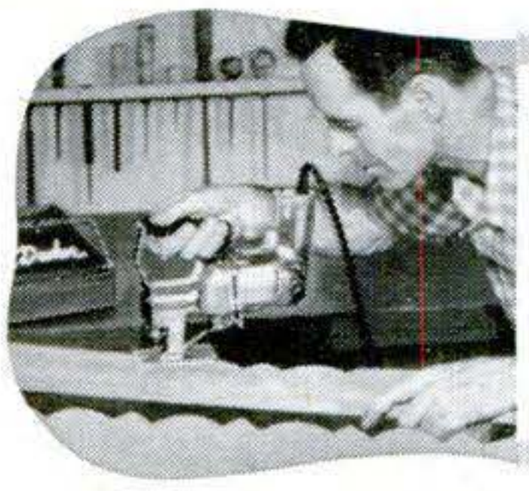

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Big Bombers Learn Hit-and-Run Trick
[Continued from page 139]

his feet alone—like a kid on a sled. It was sloppy—but it was safer.

"Question," I said. "What if you had lost an engine or two on that tall climb?"

"Not a thing—today," Tinsley said. "We were light. But if we were heavy with fuel and carrying an H-bomb, it wouldn't be healthy to lose power. The plane just might spin inverted."

"Could you get out of such a spin?"

"No," Tinsley said. "But we aren't worried about losing engines with this airplane. We've got the old J-47s—about the first jet General Electric made—and you can't beat them for dependability. A lot of planes are still operating original engines installed in 1952."

Which led, directly, into the story I'd come down to get: the big-picture significance of toss-bombing with a Boeing B-47 jet bomber. The B-47 was, of course, built to deliver bombs in the conventional manner—flying straight and level at high altitude. A few years ago, this system was fine. You could get there and make your drop and get away—because jet fighters and guided missiles had not caught up to you yet.

Not so today! The new Mig 19s fly 1,000 miles an hour against the B-47's 600. Their guided missiles are fiendishly fast and accurate. If a B-47 tried to attack deep inside Russia at 40,000 feet and 550 miles an hour, its chances of coming home again would not be bright. Since the U. S. Air Force has purchased over 2,000 B-47s at a cost of $3,000,000 apiece—an investment of six billion dollars—the big picture did not look good.

Comes now the Low Altitude Bombing System—LABS for short—which proved so potent that it was immediately adopted by the entire Tactical Air Command. The little single-engined jets could streak in on the deck, sling a huge atomic egg, and loop out of the picture without getting blasted to bits by their own explosion.

So why not try it with a B-47?

A lot of people were skeptical. They felt the wings might buckle or the jet pods twist loose under the strain of the pull-up and the roll-out on top of the loop. Boeing test pilots (reportedly paid a fat bonus for the first LABS run) tried it—with their hands on their ejection handles. Nothing happened. Not even a wrinkle on

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the skin. So the project was turned over to pilots at Eglin Field (no bonus for them) to perfect. Eglin, of course, is the Air Force testing ground for problems and machinery from cotter pins to B-36s.

Eglin rolled up its sleeves and tackled LABS. First they developed a special bombsight. Then they married it to a brand-new system of low-altitude navigation that would take the pilots to their targets at treetop level. Finally they ran a test, no holds barred. They alerted the Air Defense Command that they were going to attack a city deep inside the coastline with a single B-47 using LABS. Fighters were swarming in the skies when the B-47 came in—at a hundred feet of altitude, at night, wide open—but the first time anybody heard from the raider was when it zoomed upward in its LABS run over Atlanta. Not a fighter had got within a hundred miles of it! This was enough to sell General LeMay. Today, the Strategic Air Command's hundreds of B-47 crews are learning the technique.

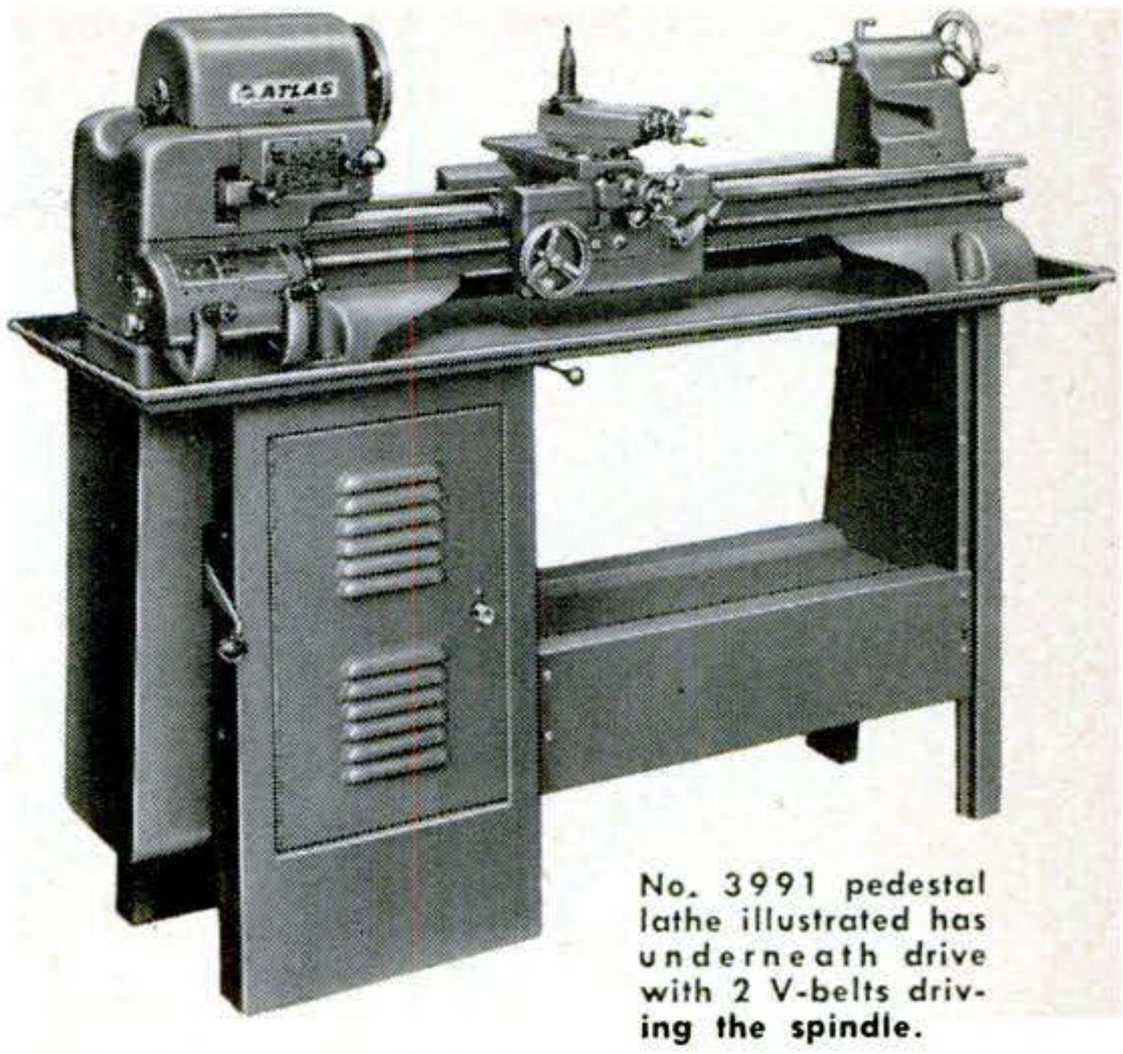
Why is toss bombing so potent? First, because the B-47s go in at such a low altitude that they are lost in the "ground clutter" of defense radar. Since they would attack at night and in bad weather, and would zigzag on their run into the target, they do not expect to be detected until they have their multi-megaton H-bombs in the air. Bomber pilots, understandably, are enthusiastic about the technique. Being treetop high, they are safer from radar-guided missiles.

There's a second advantage. At treetop level, planes are comparatively safe from the 1,000-m.p.h. Mig 19s. If a stub-winged fighter makes a diving attack on a low-flying bomber, he stands a very good chance of not being able to pull out, winding up 10 feet underground. It sounds a little wild to say that an LABS bomber is unstoppable—but this, right now, is very close to true.

The great news to the American taxpayer, of course, is that the B-47 fleet—all six billion dollars' of it—has actually been reborn.

"I can't understand why everybody is shook up over Russian ICBM's," Major Tinsley said. "Even a grade-school kid knows it's easier to hit something when you are directly above it than when you are 5,000 miles away. Right?" END

NEW Atlas 12" LATHES



No. 3991 pedestal lathe illustrated has underneath drive with 2 V-belts driving the spindle.

The new Atlas 12" lathes are available in bench models with standard change gears or quick-change gears, and in two underneath drive models with pedestal base as illustrated.

Completely new inside and outside—from the ground up—with greater capacity, performance and value than have ever before been available in lathes at or near their low price.

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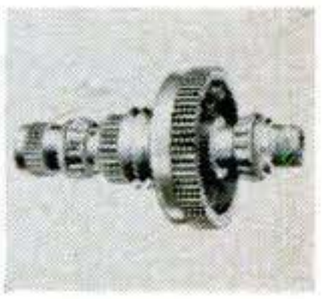

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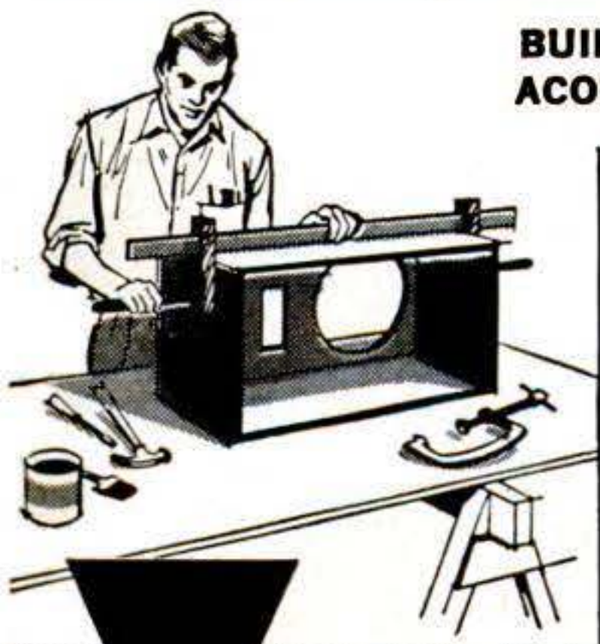

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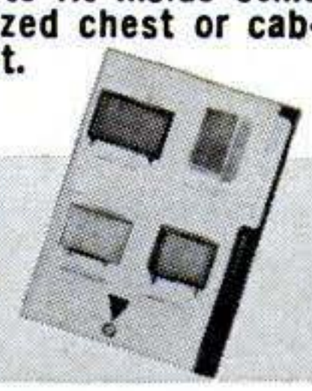

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The Wonderful Way We Hear

[*Continued from page 168*]

ments aren't built alike, partly because they aren't played alike.

If you could see the sound waves of the piano's middle C, as indeed you can on an oscilloscope that is hooked up to a microphone, you would notice at once that they were full of crinkles. If then you were to take a separate look at the sound waves of the violin's middle C, you would recognize that the pattern of crinkles had changed.

Miraculously, each little crinkle in a sound wave affects the eardrum and the basilar membrane in a particular way and has a meaning all its own to the brain. Thus, when the sound waves of the two middle C's arrive simultaneously in the ear, each triggers its individual set of nerve impulses, and the brain can tell one instrument from the other.

Amazing? Then just remember the spectacular performance you get from your team of ears and brain when you listen to a symphony orchestra!

Here, though, is gloomier news: A lot of us who think we hear fine really don't. At its youthful best, our range of hearing includes all the sounds from 16 cycles per second to 20,000. As we grow older, those hair-trigger nerve cells in the inner ear don't respond as well as they used to. They start missing the higher frequencies. By the time we have passed the age of 40, few of us, when the sound volume is low, can hear frequencies above 8,000 cycles per second. There's a jolt for hi-fi fans!

At the same time that the inner ear's nerves are playing out, the tiny bridge of bones in the middle ear may start stiffening. When this happens, it doesn't respond to the eardrum's nudging as smartly as it did before. It doesn't pass along to the inner ear the sound waves of low energy and high frequency. As a result, we can't hear soft tones, gentle voices, high notes as well as we used to.

Eventually we may arrive at the stage when we have to say in exasperation, "I can hear your voice perfectly well but I can't quite make out what you are saying." By this time, our ears are catching only vowel sounds, of relatively low frequency, and fumbling the high-frequency consonants, which make sense out of the vowels.

Sometimes, calcium deposits form and

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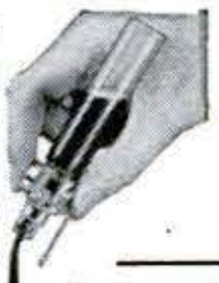

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halt the movement of the middle ear's bony bridge altogether. When that happens, we become hard-of-hearing.

Surgery knows two ways to remedy this situation. Both are tricky operations. One consists of bypassing the bridge and making a "window" in the inner ear for sound waves to enter. The other, even more delicate, involves breaking the calcium roadblock and freeing the bridge.

Deafness is normally gradual and partial. It frequently involves both nerve deterioration and sluggish functioning of the middle ear. For these cases, a hearing aid is a fine help.

No aid can restore perfect hearing, but it often does bring back to the wearer a great deal of lost efficiency and pleasure.

Aging isn't the only cause of deafness, of course. A sudden explosion near an ear can rip the basilar membrane off its moorings and knock out the nerve of hearing forever. A flying flake of hot metal or a spatter of chemical can destroy an eardrum. A severe illness with high fever, especially in children, can permanently damage the hearing nerve. Infections of the middle ear can crimp its capacity to conduct sound.

Sometimes a man's job subjects him for long periods to intense noises that eventually damage his hearing nerve. Men who work with drop-forge hammers, riveting machines, punch presses, jackhammers and sand-blasting outfits frequently become hard-of-hearing.

The roar of jet planes passing overhead, or the sharp crack of an occasional sonic boom, does no damage to our ears, the experts say. But the Air Force now orders mechanics who regularly work on jet engines to wear both ear plugs and ear muffs, and limits the time they can spend close to a screaming engine.

To protect the ears of passengers in our first jet transports, Boeing and Douglas are taking steps to guarantee steady sound-pressure levels in the cabins of those planes—and are providing noise suppressors for the engines, to spare the ears of people who live near the airports.

In this wonderful age of sound, they're going to need their hearing more than ever. END

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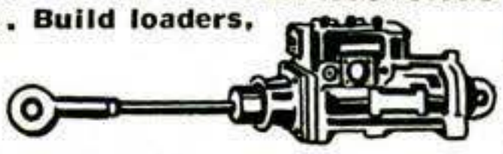

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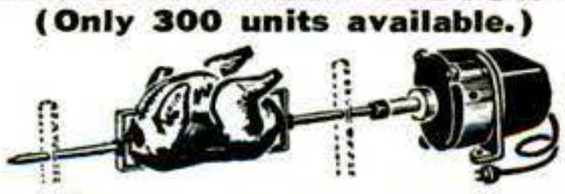

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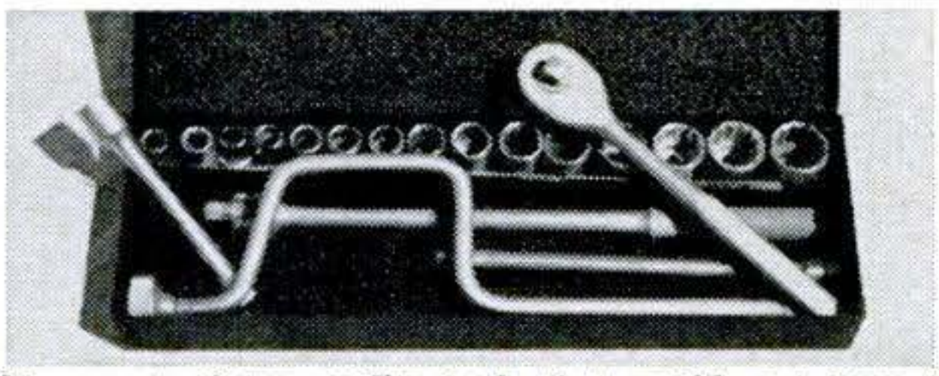

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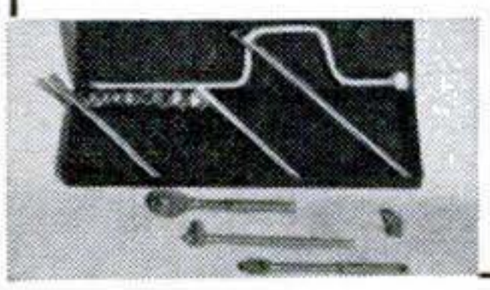

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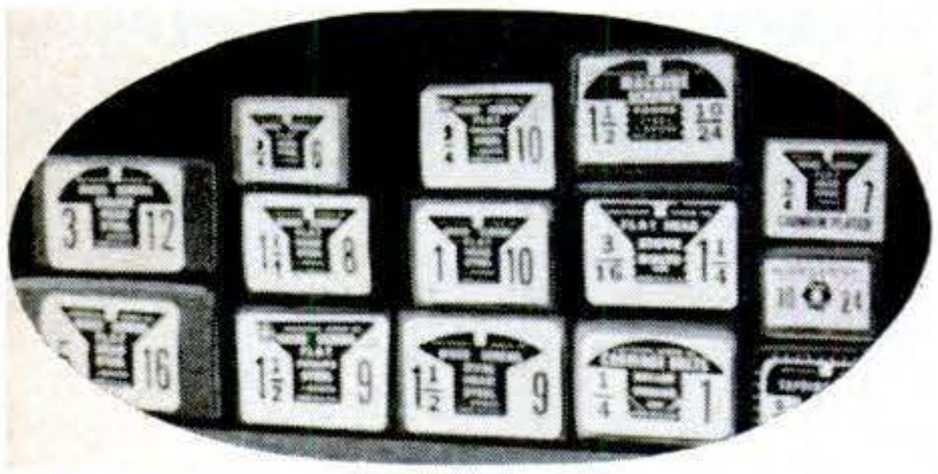

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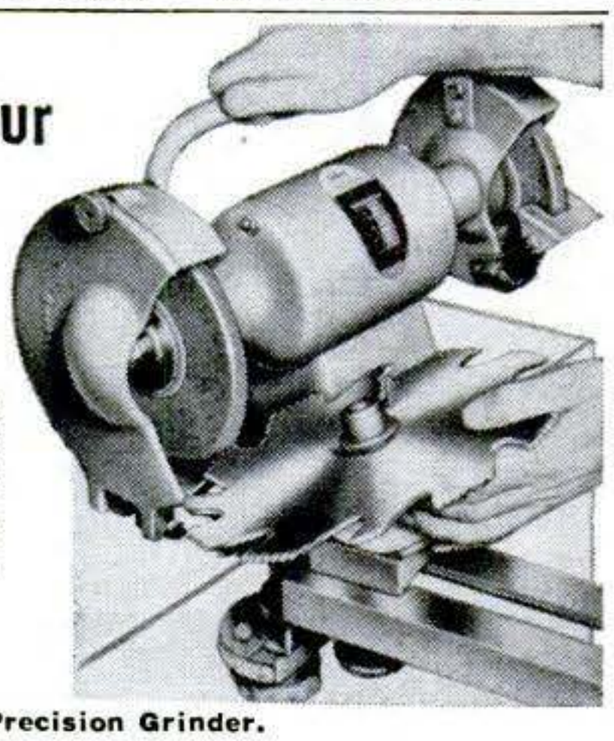

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How Good Is Russia's Technology?
[*Continued from page 135*]

cow from 300 miles away, both kerosene and electricity are extensively used for cooking. A one-burner hot plate costs only 24 rubles; a handsome electric kettle—resembling our whistle kettles—costs about 60 rubles. (It was one of the few products I saw that could conceivably have found a market at the equivalent price here.) There are huge stocks of aluminum pots and pans, mainly cast rather than fabricated.

Flashlights were out of stock wherever I asked for them, though there were plenty of batteries—the kind common in Europe, with three cells assembled into a unit and spring terminals emerging from one end. I finally managed to buy one flashlight—a hand-powered, battery-less job—and later took it apart. Like so much else in Russia, it was paradoxical. The generator flywheel was well balanced and the drive clutch ingenious. But all shafts run in unbushed holes, and the light's reflector was sloppily plated. For his 34 rubles, Boris gets a light that works fairly well but could work much better.

Do it yourself seems to be as much a part of Russian life as of our own, but on a simpler level. Nowhere did I see any power tools, circular saws or even electric drills. (No doubt these were made, but for industrial use rather than for sale in state stores.) The one rather surprising exception was a tiny watchmaker's lathe. Well made and priced at 2,000 rubles, it was a tool to delight a modelmaker.

Russian hardware stores bear little resemblance to our well-stocked and gadget-filled shops. One in Moscow had two small, neat display windows. Inside, all merchandise was out of reach, in glass-topped counters or on wall shelves. There were no displays or display cards—just price tags. Milling customers competed for the attention of the four salespeople, three of them girls. A young man tended a counter of locks, padlocks and door hardware—products that seemed to me heavily styled and poorly finished, but eminently serviceable.

In other glass-topped counters were woodworking, automotive and machinist's tools, including taps, reamers and micrometers. While many items were stocked, there was little choice among individual ones. Screwdrivers and chisels had poorly

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ground tips and edges, and crude handles. Often Ivan doesn't get a ready-to-use tool —he gets something he can grind, file and polish into a tool.

Finish is skimped on many Soviet articles. Packaging is also sketchy, with flimsy boxes and childlike labels. (Why add eye-appeal if your product has no rivals?) There are some exceptions—cigarettes, film and phonograph records—but most things are finished and packaged with no eye for appearance. Often your purchases are casually wrapped in paper like a few pounds of hamburger.

In GUM, a huge Moscow department store, I encountered vestiges of salesmanship when a salesgirl pointed out that a de luxe alarm clock at 75 rubles was really better than a bigger one at 55. She was right, too; it's a handsome, skillfully made clock, equivalent to a good Swiss or German one. (Incidentally, while there are plenty of clocks on sale in Russia, the wrist watches worn by foreigners still have the same mysterious lure that they did in World War II. It is a common experience to be asked by a covetous comrade to trade your wrist watch for 500 or even 1,000 rubles.)

The photo shops I visited had plenty of still and stereo cameras, many of them reflecting East German designs. I had no trouble buying Russian film, including a medium-speed panchromatic and a color-negative type of color film. Enlargers, projectors and photoelectric exposure meters are available. The Leningrad meter I bought is sensitive even in dim light, is nicely designed, and gives readings identical with those of a high-quality American meter.

There are curious gaps in the line-up of Russian consumer goods. I saw plenty of mechanical pencils and fountain pens—but no ball-point pens, which are, as a consequence, highly prized. I couldn't buy a pencil sharpener, but I was impressed by the variety and quality of drafting instruments. Fluorescent lamps are rare, except in commercial installations, but there's a profusion of incandescent lamps of all kinds. Unprepared for the concept of Comrade Santa Claus, I was startled to find strings of Christmas-tree lights. The answer here, though, was simple: The lights are manufactured for celebrating New Year's. END

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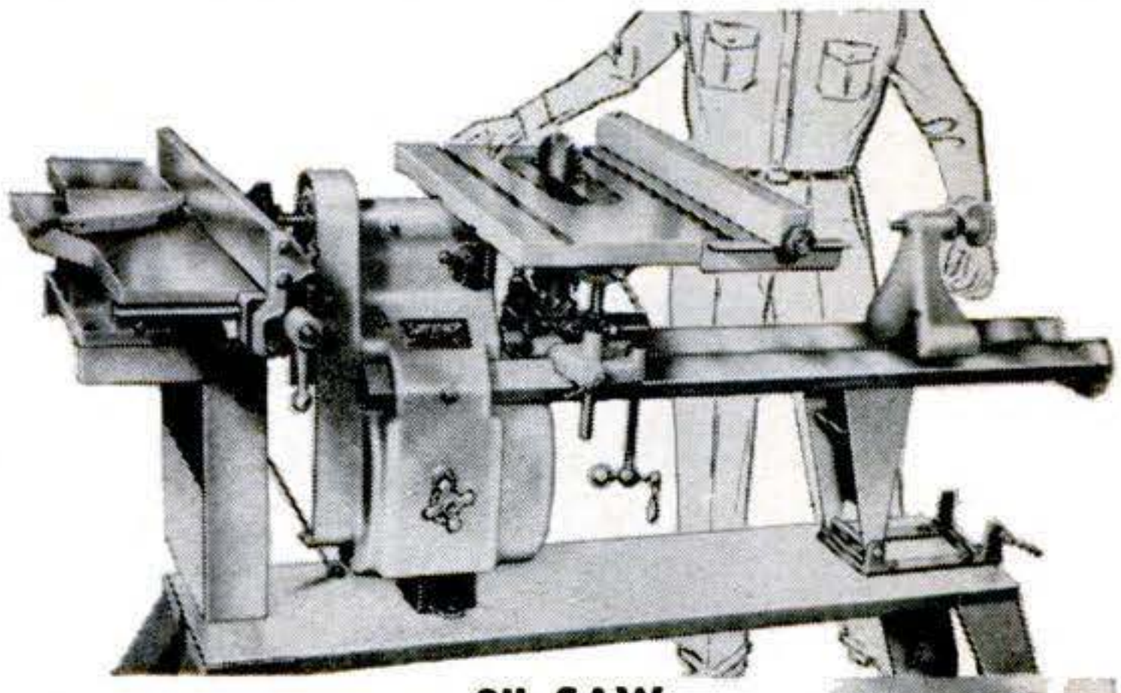

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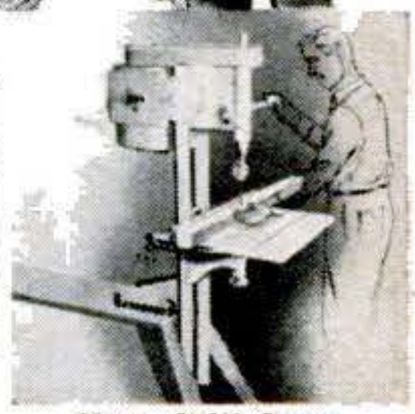
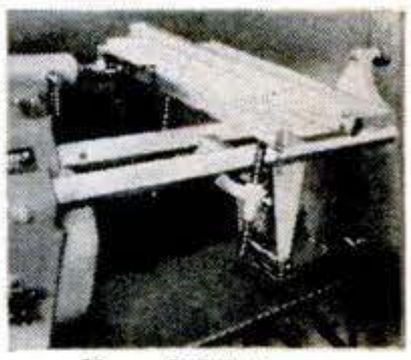
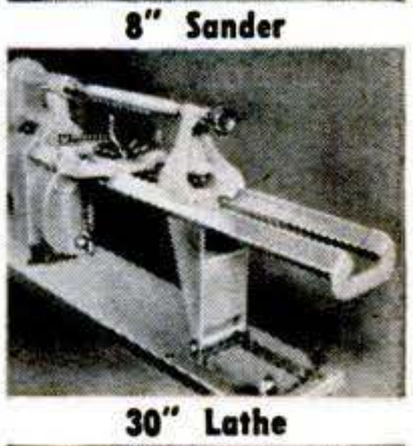


Vert. Drill Press



Hor. Drill Press

8" Sander



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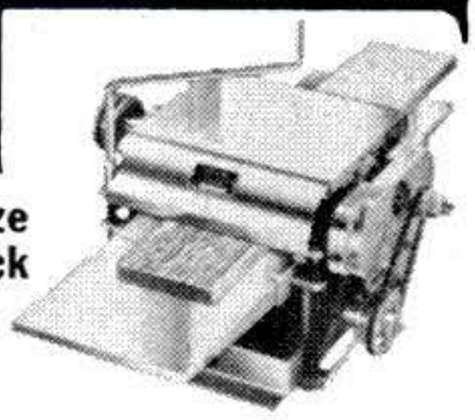

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[*Continued from page 129*]

illacs have an excessive amount of glitter on the dash.

You'll find similar contradictions among other manufacturers. The Chrysler people have been extremely conscious of safety design; and yet I found the Dodge notable for a multiplicity of interior reflections—in five different places its instrument panel mirrors your face. In Plymouth and Dodge a heater control and an ash tray are in a frame lower than the dash: a knee-and-shin hazard. And from Plymouth to Imperial, the driver's left knee is riskily near the hand-brake lever.

Are designers unaware of the Cornell finding that low extremities rank second to the head as the most frequent points of bodily injury? The folks in the back seat may think so—particularly in two-door models, where the only happy fella will be one with no legs. In the Dodge, especially, the way your insteps are squeezed under the front-seat frame would mean painful injury in a crack-up or roll-over. (The company man who was with me unwittingly proved this: He slid the driver's seat back while I was exploring the foot room, and nailed me to the cross of research.) Plymouth offers little advantage in this respect; Ford and Chevrolet are better; the Studebaker Hawk is worse.

Lincoln has a beautifully clean, glare-free dash, with all protruding knobs well out of the way; its shin and knee clearance are excellent. Yet they turn right around and stick an optional FM radio on top of the transmission hump that will not improve your girl's pretty knees if she comes hurtling forward in a panic-braking stop. You don't have to buy the radio, of course, but a rubber casing would make it safer.

Mercury shares with the rest of the Ford lines what seems to me to be the best crash padding in the field: You can punch this with all your might and not hurt your knuckles—a thing I don't hanker to do with some other crash paddings, notably Studebaker's. Yet Mercury leaves the underportion of the dash unprotected and slanting forward much too close to the knees.

Studebaker-Packard introduces the commendable idea of heavily padding the door panels beneath the trim, and elimi-

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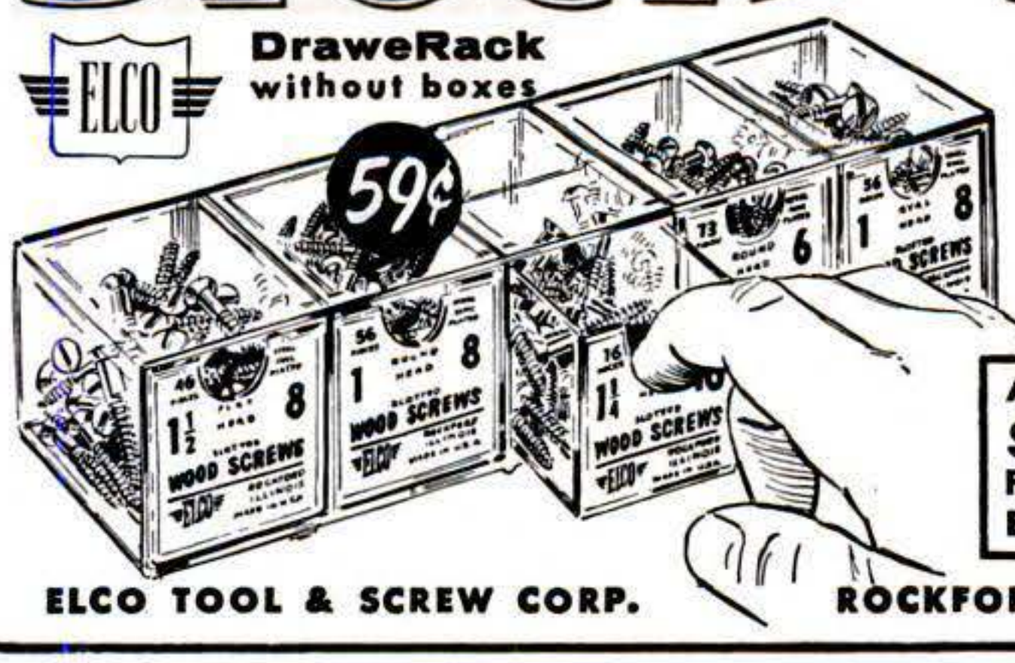

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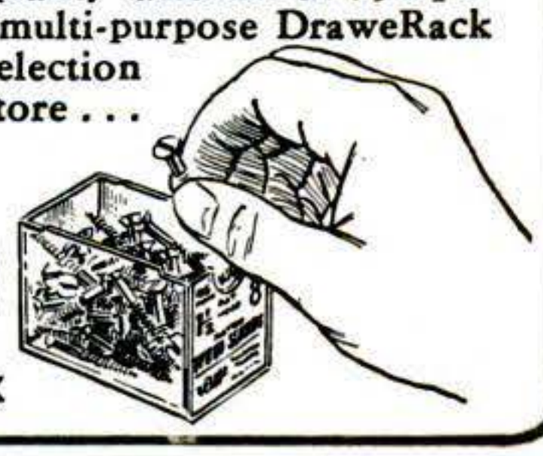

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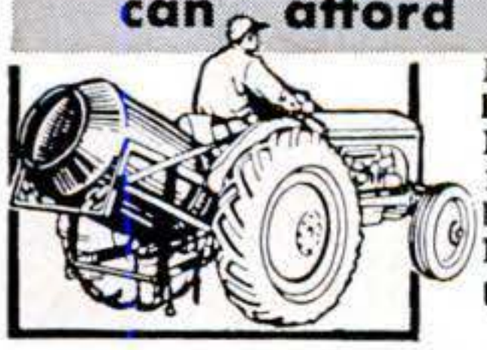

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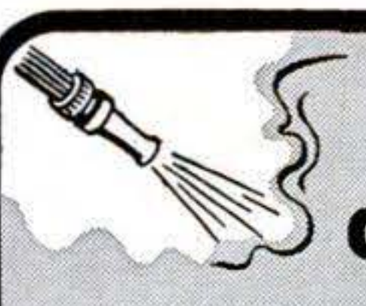

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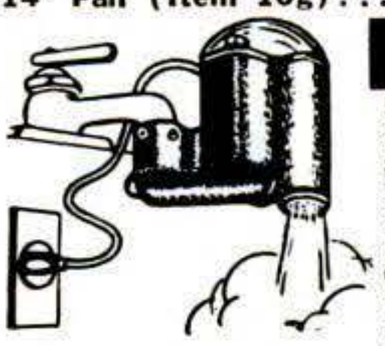

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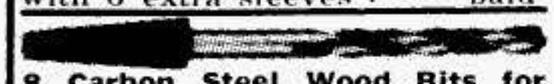

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How Safe Are the '58 Cars?

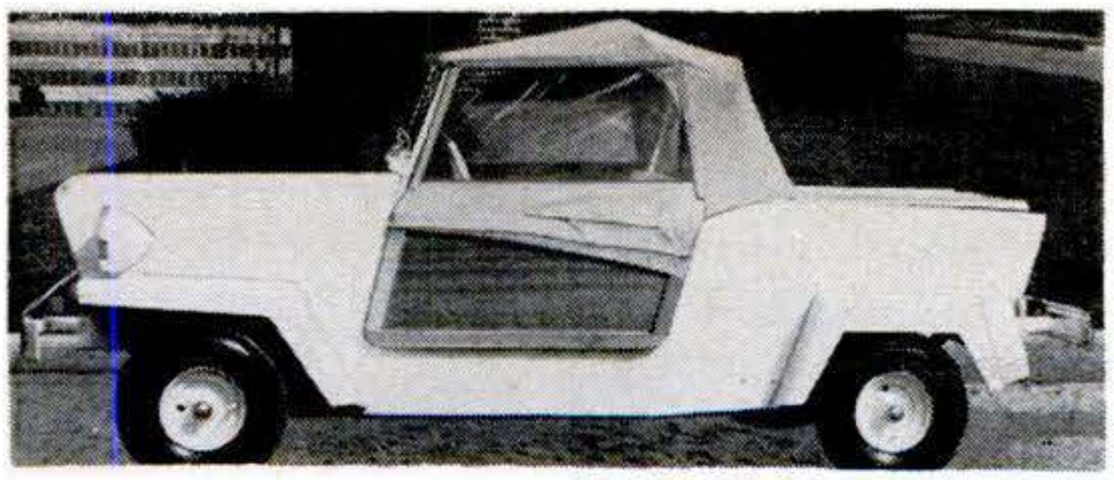
nating metal mouldings. Yet it leaves the hand brake in the knee-cracking right-hand position. And window cranks and door handles still protrude as a serious threat to any man who has attained full growth. You find the only significant attempts to remedy this hazard in the lowest and highest price range. In Chevrolet, most knees will go between the door handle and the window crank, instead of resting against one or the other. In the Lincoln and Continental, a new full-length padded armrest extends far enough out to protect anybody's knees.

In two other departments, the entire industry is in the wrong direction: the exhaust system and the tires.

About exhaust, there is reason to believe that much of our sleepy-driver trouble may come from carbon monoxide. Highway checks of over 2,000 cars by California and Connecticut troopers revealed a startler: *No* car was free of exhaust fumes. And prolonged exposure to even minute concentrations brings drowsiness. Some tests indicate that much of the trouble is improper positioning of tailpipes. Their termination inside and below bumpers permits toxic gases to be sucked up and forced in through open windows. There is room here for more research; Cadillac, Corvette and De Soto may be on the right track by exhausting straight back through the bumper itself. Pontiac's bumper exhausts, however, are dummies.

As for tires, there was little excuse for the 14-inch wheel—and, safety-wise, many objections. Front-wheel overloading continues in all lines. True, 1958 tires are fatter, putting more rubber on the road for better traction—with Imperial's 11-by-14's taking the cake. But unless they are rotated much more often than usual, and unless you use four to six pounds' more pressure than the book calls for, most standard tires are going to fail prematurely in sustained speed driving.

These deficiencies notwithstanding, the 1958 cars attain a new level of safety in design and engineering. How this stacks up against the ideal can only be evaluated by comparison with the Cornell-Liberty prototype of a truly safe car. Underneath all the chrome, anodized aluminum and stainless steel, Detroit can still find much room for improvement if and when it wants to. END



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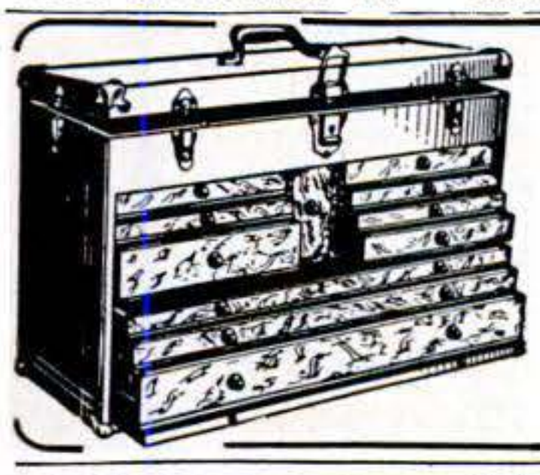

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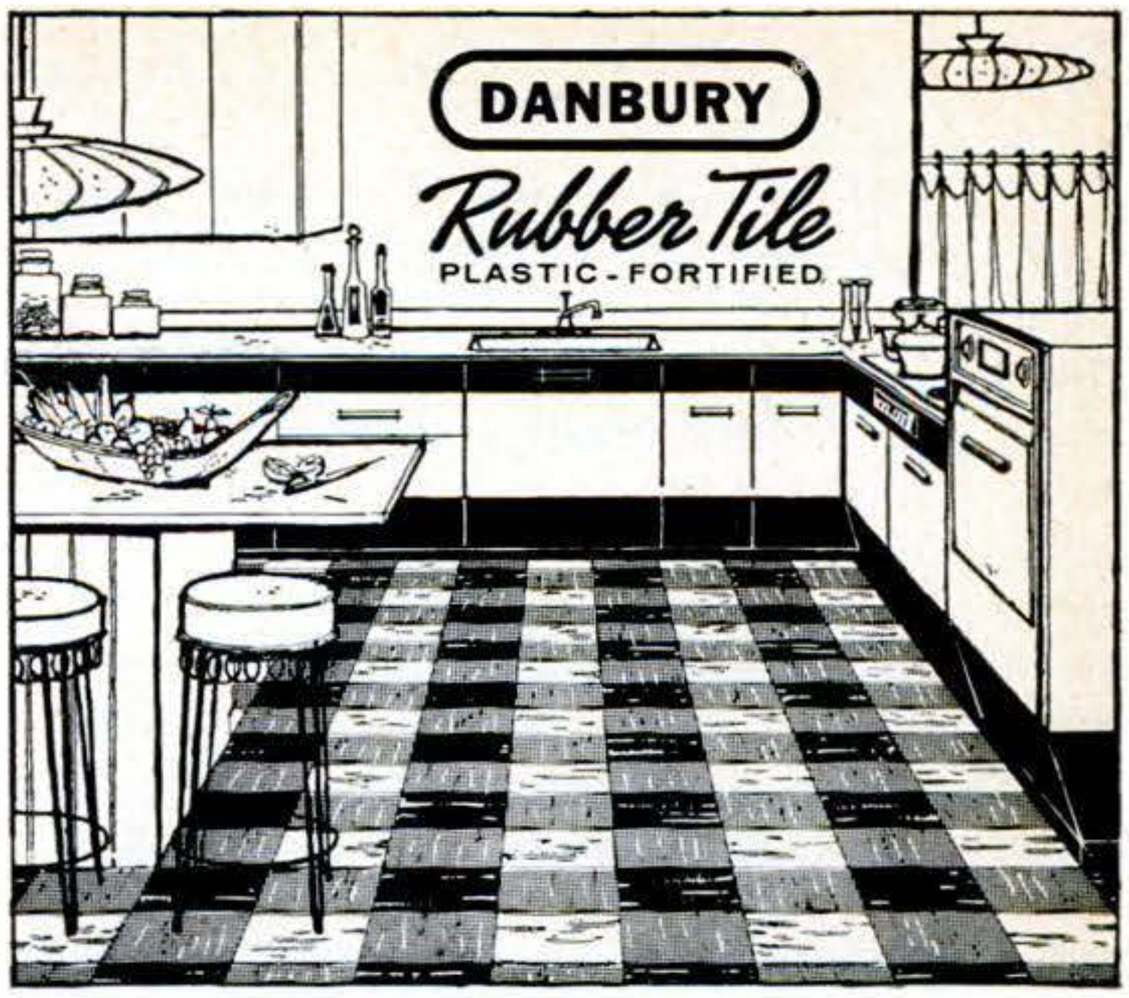

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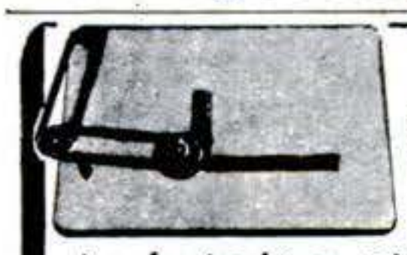

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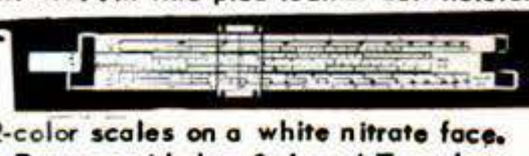

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[Continued from page 176]

Most 6½″ saws weigh between nine and 12 pounds. Some lower-price models weigh as little as 6½ pounds. Selection should be based on your own ability to swing the weight around. A good rule is to buy the heaviest saw you can comfortably handle. For normal cutting, the saw slides on the work and causes no strain. Remember, though, that at times you may have to hold it vertically or overhead.

Handles. Don't judge the balance of a portable saw just by picking it up as you would with other tools. See how the saw feels right on the work.

Handles located all the way back of the blade make for easier pushing on both flat and vertical work, but result in a clumsy off-balance feel when you lift the saw. Handles set above the motor seem to have better balance, but may be more difficult to guide across the cutting line on flat work. Some handles are also too far to one side, so that the saw tilts when you lift it.

Bevel and depth adjustments. The depth-of-cut adjustment is made by dropping the back end of the base plate. This enables you to retract the blade for internal cuts or set it so it just protrudes through the wood when you're working on saw horses. Bevel cuts are adjusted to the required angles by swinging the plate down at one side.

Just make sure that the saw you pick is designed so there is no movement when the adjustments are locked. This means that the pivot pins should be tight-fitting and the anchor brackets heavy enough to prevent twisting.

The adjustment locks may be either wing nuts or levers. You may have to work them while wearing gloves or holding the saw with one hand, so be sure that the wing nuts are readily accessible and large enough to be turned easily.

Levers are satisfactory if they are correctly shaped and located. But some levers are too short and fit so closely against the housing that they must be pried free.

What kind of bearings? Top-quality saws have ball bearings throughout. Cheaper saws have bronze sleeve bearings which may wear and result in drive-shaft vibration. If ball bearings are not of the sealed-lubricant type, the saw should have easily accessible oil or greasing holes.

Commutator brushes. The chief cause of motor failure is worn motor brushes. Inspection and replacement of brushes are easy if the saw has exposed holder caps accessible from outside the motor housing. If the brushes are concealed, considerable disassembly of the saw will be necessary to reach them.

Base plate. The plate that rests on the work must be of a size to provide steady support, and be rigid enough to take abuse without damage. Some saws have a "wrap-around" plate that extends to the right of the blade, giving support when cuts are started at the left of the work.

The plate may be of cast or stamped aluminum or of steel. The bottom surface must be free of burrs so it will slide smoothly on the stock.

Blade guard. The telescoping guard is standard on all models today. Most guards have a simple exposed coil spring, which works well, with a handle for retracting the guard when you want to make pocket cuts.

The front end of the guard is shaped for ease of starting into the cut. Some types may have less tendency to catch against the wood edge than others, but guards on all standard makes work well.

Accessories. A saw table extends the usefulness of a portable saw, but don't get any ideas that it will make the precision cuts of a regular table saw. The table helps speed duplicate cutting and ripping and permits the use of jigs.

The track-type saw guide, made by Stanley, is safe and useful for lining up square and bevel cuts, but capacity is limited to the 34¼″ track length. The track is used on a bench drilled for pivot pins to set the track at any angle.

Protractors made by B & D, Stanley, Skil, Mall, Porter-Cable and others are very helpful for laying out angle cuts and for steering straight across the stock.

Service and parts. Any saw you buy may need replacement parts or expert repair service. Make sure that the company has made arrangements for convenient consumer service through factory branches or qualified repair firms—located near your home town, so that any saw sent in will be returned without too long a delay. **END**

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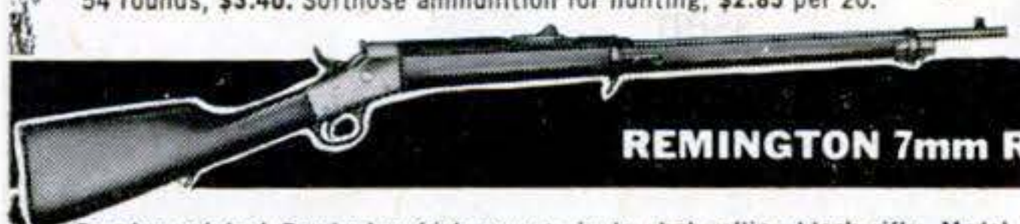

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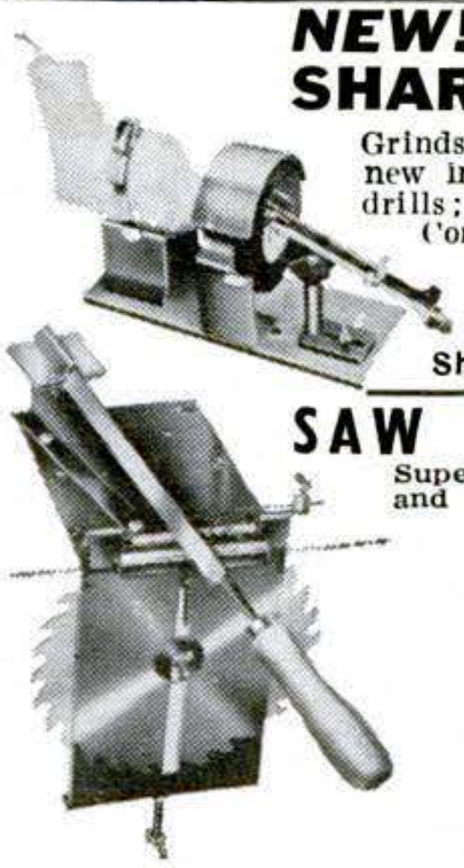

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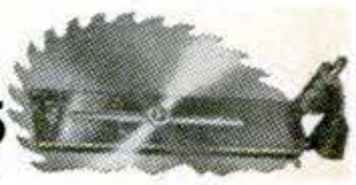

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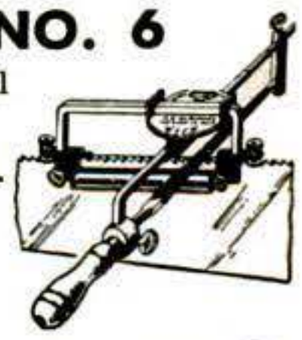

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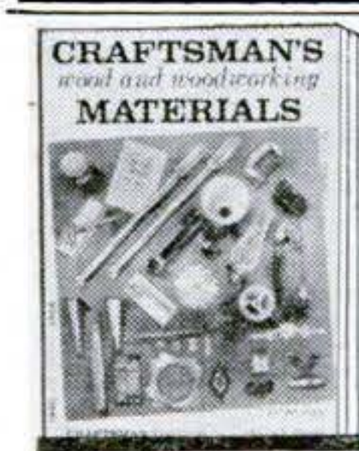

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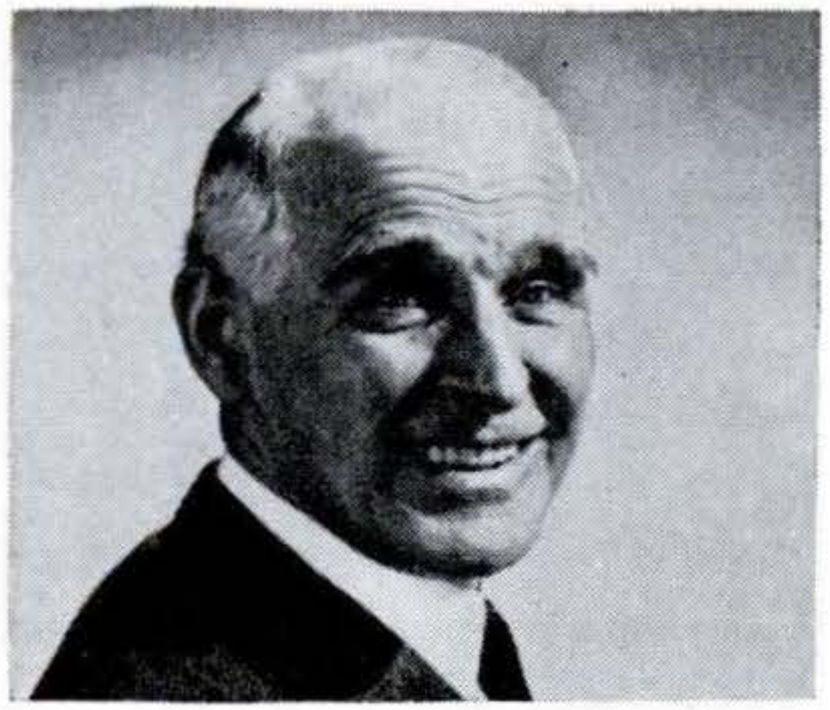

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